RAILROAD GAZETTE

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CONTENTS

ILLUSTRATIONS:	PAGE.
History of Railroad Signals	560
Ashland Station, Wisconsin Central	561
Riveting Shop, King Bridge Co	562
Improved Sleeping Car Berths	563
Steel Rails	564
CONTRIBUTIONS:	
Valve Travel and Locomotive Efficiency	559
The Enlistment of Railroaders	559
EDITORIALS:	
The Effect of Valve Travel on Efficiency	566
Massachusetts Highways and the State	566
The Chicago & Northwestern Report	567
Editorial Notes	566, 568
New Publications	568
Trade Catalogues	568
GENERAL NEWS:	
Car Building	569
Bridge Building	569
Meetings and Announcements	570
Personal	570
Elections and Appointments	570
Railroad Construction	570
General Railroad News	571
Traffic	572
MISCELLANEOUS:	
Technical	565, 568
The Scrap Heap	569
Notes on German Railroad Practice	559
Books on Bridges	559
Liverpool Overhead Railway	561
Long and Short Indicator Connections	562
Corrosion of Iron Pipes by the Action of Electric Railroad Curents	563
Railroads of the United States in 1893	565
The Resistance of Materials Under Impact	565

Contributions.

The St. Alban Landslide.

In the description of the St. Alban landslip on page 458 of our issue of June 29, we omitted to state that the article was the result of a visit to the ground by Mr. P. S. Archibald, Chief Engineer of the Intercolonial Railway, and his assistant Mr. W. B. Mackenzie. The article was written and the drawings made by the latter, under Mr. Archibald's direction. The photographs are the work of the well-known photographer, Mr. Livernois, of Quebec. Some interesting geological notes by Mr. Archibald arrived too late for insertion with the article.

Valve Travel and Locomotive Efficiency.

PRINCETON, ILL., July 14.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read lately that increasing the valve travel of locomotives makes them wasteful of fuel.

The Superintendent of Motive Power of the Old Colony Railroad and others say they have noticed this in experiments they had made, that increasing the travel made a smart engine but wasteful of fuel. Did not the Rhode Island Locomotive Works some years since build an engine for special fast service with long valve travel, which engine was a failure, until remodeled by the road owning it? Please explain why the increase of valve travel to 6½ or 7 or 7½ inches should make a smart, wasteful engine, while one with 4½ inches travel is economical but lazy.

A. BLANPIED.

[See the editorial pages—EDITOR.]

The Enlistment of Railroaders.

NEW YORK, August 7, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The letter of Archimedes Stephenson Watt, contained in the issue of the *Railroad Gazette* of August 3, 1894, on the "Enlistment of Railroaders," will attract much attention and, let us hope, some discussion. It may interest you to know that Dr. Barnard, some time President of the Chicago & South Side Rapid Transit Company, not only conceived but carried out many of the suggestions of Mr. Watt. His men were all uniformed, even to the highest officers of the company, and so long as he remained in its employ he required that all employees, from the president to the last employed trainman, should invariably appear in his uniform when upon duty. He also organized a court of investigation, patterned after the fashion of the military court martial, whose duty it was at certain stated periods, or upon unusual occasions, to investigate complaints, violations of instructions, etc. The men were put upon oath at these investigations, and shortly before Dr. Barnard left the service he assured me that he was more than satisfied with the experiment, and firmly convinced that a more military method of dealing with the men employed on railroads would, to a large extent, do away with the troubles that are now experienced.

One who has had some experience with trainmasters' investigations on railroads will easily appreciate the greater hold that will be secured upon men, and more accurate information that will be derived when they have the fear of perjury before their eyes, than when they are asked a few questions in a desultory manner, and with the knowledge that nothing more serious can result from their mendacity than a discharge from their positions.

DAVIES LEGENDRE.

Notes on German Railroad Practice—Passenger and Freight Cars.

BY MR. E. M. HERR.

In the year 1891-92 there were on the railroads of the German Empire 27,512 passenger cars, classed as to the number of axles under each as follows:

Cars with two axles, average weight empty	21,300 lbs	21,795
" " three " " "	32.000 lbs	5,347
" " four " " "	52,000 to 68,200 lbs	370
Total		27,512

The other cars are classed as follows:

Total number of baggage cars	6,903
" " " postal "	1,776
Cars in freight service—	
Box cars	86,878
Flat and coal cars	199.619
Stock cars	5,883
Total, each weighing empty on the average 14.000 lbs	292,380
Average cost of passenger cars	$2.073.00
" " " freight cars	732,00

The use of brakes on both passenger and freight equipment of German railroads is much less general than in America. Of the 27,512 passenger cars but 17,900, or about 65.4 per cent. have brakes of any kind, and 13,829 or 50.3 per cent. continuous brakes. On cars equipped with brakes but 62.4 per cent. of the axles are braked. Of the 301,059 freight, baggage and postal cars on the German Government lines but 96,792 are equipped with brakes, and but 4,256, mostly baggage cars, have continuous brakes. On the freight and baggage cars having brakes but 32.06 per cent. of the axles are braked.

Passenger cars, as is well known, have generally side entrances into compartments seating from 6 to 8 persons. The newer designs for passenger equipment are nearly all provided with end platforms and doors leading to a center aisle extending throughout the car. This aisle is sometimes on one side but more generally in the center. The inside of first and second-class cars is usually divided into three compartments. First, a first-class compartment usally seating ten people, next a second-class compartment for passengers who do not smoke, with seats for fourteen. Between these compartments is a small toilet room. Lastly, and occupying the opposite end of the car from the first-class compartment, is the second class smoking compartment seating twenty-eight persons. The seats in both first and second-class cars are well upholstered, with good springs in seats and backs, the latter being higher than the head of a seated passenger. The first-class seats are more roomy than those in the second-class compartments and are covered with more costly material, otherwise there is almost no difference.

The entire car is lighted with five small gas burners of about nine candle power each, one of which is in the toilet room, the other four dimly lighting the car. One jet or burner is placed in the center of the ceiling of each of the small and two in the larger compartment.

The cars are well made, the sills and entire carrying frame being of iron or steel, which is used quite freely in the entire construction. The framework of the car body is, however, of wood, as are the seat frames. Continuous drawbars with hook and link couplings drawn together with right and left hand threaded bolt are in universal use. The first and second-class cars of later design have three axles on which the car is carried by long semi-elliptic springs, the third-class cars and older first and second-class also generally have but two axles. The inside finish of the third-class cars is very plain, none of the seats being upholstered. The compartment for smokers is larger in third than in first and second-class cars.

Nearly all first, second and third-class cars on the principal German lines are now heated by steam from the locomotive. Fourth-class cars are only run on the Prussian roads, and have merely a seat consisting of a board of proper width running around the sides of the car. Many of the fourth-class passengers sit on the large amount of personal baggage which they almost invariably carry.

The design and construction of the under framing of freight cars is also of iron and quite similar to that of passenger equipment. The body of box, stock and largely also of coal cars is of wood. These cars are all small, none exceeding 33,000 lbs. capacity. All roads being owned and operated by the government, the entire freight equipment is arranged for possible military service. Each box car is provided with supports for seats placed crosswise for troops; and also with attachments for adapting the car to carry horses; whiffle trees and connections to enable the cars to be drawn by horses are also provided. On the outside of the car body, besides the capacity of the car in kilogrammes, the number of men and horses it will accommodate is also marked. Nearly all freight cars have but two axles with four semi-elliptic but much shorter springs than under passenger cars.

The journal bearings are usually brass shells filled with white metal. The journals are surrounded by boxes usually made in two parts and divided on a horizontal plane through the center of the axle with arrangements for oiling both through the bearing from above and into the bottom of the box. The oil is fed to the journal by a pad held against the under side of the journal by springs, and to which a supply of oil from the bottom of the box is fed by cotton wicking. The two parts of the box are held together by a hinged yoke with a clamping bolt passing under the box.

There are a few hospital cars fitted with berths and appliances for the care of the injured held for use in emergencies in various parts of the country. The best are fitted with removable beds so the injured can be carried from the car to the permanent hospitals without difficulty.

The repairs and maintenance of both passenger and freight cars are very carefully looked after. All first-class passenger cars are sent to the shop every 9,000 to 12,000 miles run, and no passenger, baggage or postal car is allowed to run to exceed 18,600 miles between repairs. All freight cars must be shopped for general repairs every three years. When passenger cars shopped have reached the above limit of mileage they must be thoroughly dismantled, all wheels and axle bearings, springs, and draft gear removed, and sills and framing thoroughly inspected.

Oiling of freight cars is done principally at terminals or junctions and in a similar manner to American practice. On some roads the regulations provide that freight cars shall be regularly oiled once every two months, but at division points and junctions inspectors may often be seen putting a small quantity of oil in each journal box without regard to its condition and with little or no examination. Dust guards are made of wood and often with a leather strip around the axle hole. This is found more expensive than a strip of felt, which is replacing it. With passenger trains a man is sent on the train with a supply of oil whose business it is to see that no journal runs hot. He is allowed a certain amount of oil, receives a premium for all oil saved from this allowance, and is fined one mark, or 25 cents, for each hot journal on the train under his charge.

All cars in both passenger and freight service are fitted with steel-tired wheels. A careful record is kept of the broken and cracked tires from which the following is an abstract.

Total number of tires in service of all kinds, year 1891-92	1,429,817
Number of tires broken entirely through during year	1,145
Number of tires cracked and removed during year	1,271
Number of tires broken per 1,000 in service	0.8
" " " cracked " " " "	0.9
" " " " and broken per 1,000 in service	1.7

A record is also kept of all broken car axles in all kinds of service, most, if not all, being steel.

Number of axles broken under cars of all kinds, year 1891-92	50
Number of axles broken per 100 million axle miles	0.645

The following table gives the average cost of maintenance and repairs of all passenger and freight cars of the German Government Railways during the year 1891-92.

Passenger Cars.

Cost of lubricating oil per 1,000 axle miles (material only)	$0.0403
Cost of material used cleaning cars per 1,000 axle miles	0.0443
Cost of material used heating cars per 1,000 axle miles	0.3104
Cost of material used lighting cars per 1.000 train miles	3.24
Cost of both labor and material for maintenance and repairs of passenger cars, not including renewing entire car, per each axle in service during year	71.75
Ditto, per 1,000 axle miles run	2.67

Freight Cars.

Cost of lubricating oil per 1,000 axle miles (material only)	$0.323
Cost of both labor and material for maintenance and repair of freight cars, not including renewing entire car, per each axle in service during the year	14.75
Ditto, per 1.000 axle miles run	1.436

Books on Bridges.

BY PROF. HENRY S. JACOBY, CORNELL UNIVERSITY.

[Some months ago we asked Mr. Jacoby to prepare an annotated list of books on bridges, thinking that it might be of considerable value not only to students but to practicing engineers. The list follows. The terms, 4°, 8°, etc., refer to the size of the page and not to the number of folds in the sheet, and are according to the standard of the American Library Association.—EDITOR.]

The literature on bridges, produced in America, is steadily increasing in volume, not only in the form of articles contributed to the various engineering periodicals and of papers read before the engineering societies and published in their transactions, but also in books devoted exclusively to this subject whether intended as text books, treatises, or reports. To facilitate reference to these periodicals and transactions, the following indexes have been issued:

Galloupe, F. E. Index to Engineering Periodicals, Vol. I, 1883-87. 6+294. p. 8°. Boston, 1888. Vol. II, 1888-92. 10+396, p. 8°. Boston, 1893. Indexes 24 selected periodicals, etc., and some others in part.

Engineering News Pub. Co. General Index to *Engineering News*, April, 1874–December 27, 1890. 6+118 p. 8°. New York, 1891.

Association of Engineering Societies. Descriptive Index of Current Engineering Literature. Vol. I. 1884-91. 14+475 p. 8°. Chicago, 1892. About 100 periodicals, etc., are indexed so far as they relate to the field of civil and mechanical engineering only. As indicated by the title, each reference is accompanied by a description, which is usually limited to one or two sentences.

The following is a list of books on bridge engineering which may be of service to students and young engineers. The descriptive notes are intended to give some idea of their scope and contents:

1. On Bridge Stresses—Analytic Method.

Diedrichs, J. H. Theory of Strains. 108 p. 34 pl. 8°. Baltimore, 1871. Stresses in roofs, cranes and simple bridge trusses.

Shreve, S. H. Treatise on the Strength of Bridges and Roofs. 20+346 p. 8°. New York, 1873. All stresses are derived and expressed in algebraic terms. Only simple bridge trusses are included.

Herschel, C. Continuous Revolving Draw-Bridges. 54 p. 8°. Boston, 1875. Nineteen illustrations in text and 10 plates. The first complete theoretical discussion in the English language of drawbridges built as continuous girders. Some of the refinements are here treated for the first time.

Merriman, M. Theory and Calculation of Continuous Bridges. 130 p., 24°. New York, 1876.

Merriman, M. Roofs and Bridges. Part I. Stresses in Simple Trusses. 7+124 p. 8°. New York, 1888.

Howe, M. A. Theory of the Continuous Girder. 8+119 p. 8°. New York, 1889.

2. On Bridge Stresses—Graphic Method.

Du Bois, A. J. Elements of Graphic Statics, and their Application to Framed Structures. 51+404 p., 8°. With atlas of 32 double-page plates. 8°. New York. 1875. The first part gives the general principles, the second part the application to simple and continuous trusses, and the third part to the arch.

Cain, W. Theory of Solid and Braced Elastic Arches. 172 p. 24°. New York, 1879.

Greene, C. E. Trusses and Arches Analyzed and Discussed by Graphical Methods. Part I., Roof Trusses. 64 p. 3 pl. 1876. Part II., Bridge Trusses. 181 p. 10 pl. Part III., Arches. 13+190 p. 8 pl. 8°. New York, 1879. Part II., deals with single, continuous, and draw spans, and Part III., includes stiffened suspension bridges as well as metallic and stone arches.

Merriman, M., and Jacoby, H. S. Roofs and Bridges, Part II. Graphic Statistics. 7+124 p. 4 pl. 8°. New York, 1890. Confined to simple trusses of roofs and bridges in addition to the principles and methods of graphic statics.

Howe, M. A. Sabula Draw by Graphics. 35 p. 8°. Chicago, 1886. Comparative determination of stresses in a draw span by both analytic and graphic methods.

Hoskins, L. M. Elements of Graphic Statics. 8+191 p. 5 pl. 8°. New York, 1892. The first part relates to the theory of graphic statics, the second to simple trusses and the third to centroids and moments of inertia.

La Rue, B. F. Graphical Method for Swing Bridges. 104 p. 3 pl. 24°. New York, 1892.

3. On Stresses and Construction.

Whipple, S. Work on Bridge Building. 120 p. 10 pl. Utica, 1847. This was the pioneer work in the rational discussion of stresses and the proportioning of members in simple trusses. A later edition, published in New York, 1872, contains 6+319 p. 8°. The treatment of details of construction of wooden and iron bridges occupies more than half of this edition.

Haupt, H. General Theory of Bridge Construction. 268 p. 16 pl. 8°. New York, 1851. The first part treats of the resistance of materials, stresses in simple trusses and methods of construction. The second part gives a description of ten wooden and five iron railroad bridges, accompanied in most cases by the bills of material. One of the iron bridges is the 55-foot span plate girder bridge invented by Jas. Millholland, and erected in 1847.

Wood, DeV. Treatise on the Theory of the Construction of Bridges and Roofs. 10+249 p. 8°. New York, 1873. Almost entirely on stresses.

Bender, C. Practical Treatise on the Properties of Continuous Bridges. 150 p. 24°. New York, 1876.

Cain, W. Maximum Stresses in Framed Bridges. 192 p. 24°. New York, 1878. Also compares several American types of bridge trusses as regards weight and considers economic depth.

Ricker, N. C. Construction of Trussed Roofs. 158 p. 4 pl. 8°. New York, 1885. Two chapters are devoted to the design of a wooden and an iron roof truss and their details of construction, while the rest of the book relates principally to stresses. As most text books on bridges also treat of roof trusses this work is inserted in the list.

Burr, W. H. Stresses in Bridge and Roof Trusses, Arched Ribs and Suspension Bridges. 1st ed. 1880. 3d ed. 1+454 p. 12 pl. 8°. New York. 1886. The discussion of stresses in bridge trusses includes also swing or drawbridges not mentioned in the title. Nearly one-third of the book treats of the details of construction and the design of a wrought iron through railroad bridge. The details of the bridge are shown on the plate.

Du Bois, A. J. Strains in Framed Structures. 1st ed. 1983. 7th ed. 228+540 p. 28 pl. sq 4°. New York. The first part (three-fifths of the whole) is devoted to the determination of stresses, the discussion relating to suspension systems and continuous girders being quite extended, while that on elastic arches is very brief. In the seventh edition the theory of the cantilever truss was added. In the second part 124 pages are devoted to describing the forms of bridge members and their details and the methods of dimensioning them, illustrated by numerous independent examples, and following this are chapters on the derivation of formulas for dead weight and economic depth, on the design of an iron railroad bridge, on shop drawings, on ordering, shipping and inspecting bridge material, and on bridge erection. The plates include detail drawings of the wrought iron truss and of a number of travelers and false works used in erection.

Johnson, J. B., Bryan, C. W., and Turneaure, F. E. Theory and Practice of Modern Framed Structures. 11+527 p. 39 pl. sq. 4°. New York, 1893. The first part (230 p.) contains the discussion of stresses in simple, continuous and cantilever trusses, suspension and drawbridges and arches. The second part opens with details of construction, followed by designs of a plate girder, an iron roof truss, a pin-connected railroad bridge, and a highway bridge, and two standard plans for Howe trusses. Succeeding chapters deal with swing bridges, trestles, elevated railroad structures, stand-pipes, tall building and mill building construction. The chapter on the aesthetic design of bridges is illustrated by numerous diagrams and half-tone views of bridges. The appendix contains articles on structural steel, general specifications, manufacture and inspection, and American methods of erection. All designs are accompanied by general detail drawings.

Bovey, H. T. Theory of Structures and Strength of Materials. 15+817 p. 8°. New York, 1893. A portion of this work is on stresses in roof and bridge trusses, including arched ribs, draw, cantilever and suspension bridges; and the details of construction also occupy a small space. The larger part is on the mechanics of engineering.

The subject of stresses in trusses is also treated in several other works on mechanics, such as those by Church and Lanza.

(TO BE CONTINUED.)

A Historical Sketch of Railroad Signaling*

The commencement of railway signaling may be said to have been contemporary with the introduction of the locomotive. Railway engineers at once recognized the importance of securing immunity from collision, and from that time to the present, a remarkable amount of ingenuity has been brought to bear upon the art. Notwithstanding this, the best practical applications have fallen short of securing the desired degree of safety. The ever varying contingencies of railway traffic, and the seeming impossibility of reducing the human factor beyond a certain point, are two of the many difficulties which have faced the signal engineer. One of the greatest difficulties in the way of efficient signaling in this country, is the lack of sufficient side track siding accommodation, and the attendant inferior arrangement of switches. This matter of proper switch arrangements greatly affects the safety of the line, and it is almost impossible to properly signal a badly arranged system of tracks. A great number of fatal accidents have been caused by using the main tracks for passing or shifting purposes. The danger in railway travel arises from the irregular movements. If all train movements could be made as laid down by the time tables, we should have few collisions. Owing to the rapid increase of railway traffic in England after the introduction of the locomotive, the need of proper signaling appliances was much sooner felt in that country than elsewhere, and we therefore turn to England for the early history of signaling.

I cannot give a better idea of the first steps in signaling, than by reading the following extracts from the *Railway Engineer* (London) of February, 1881.

"The importance of means and apparatus, for communicating intelligence, by signs or signals, between distant places, was recognized at a very early date, and amongst the earliest appliances for effecting this end, we read of the semaphore or its equivalent, which form is still chiefly preserved on almost every railway, whether home or abroad. Probably the first record of a semaphoric system is that described by Polybius in ancient Grecian history, for transmitting messages by its combinations spelling out words. In 1700, semaphores were exhibited in France, and we learn of their application again during the French Republic. A Prussian semaphore was then invented with three arms, capable of indicating 4,000 different signals. We next hear of its introduction into Russia in a more expensive and elaborate form, during the days of Emperor Nicholas I., with a view to transmitting both civil and military intelligence. But Dr. Hooke was about the first to associate his name with semaphores in this country, and in 1814 the Admiralty adopted Macdonald's system, which was subsequently improved upon by Admiral Popham and Lieutenant Colonel Pasley.

At the commencement of railway engineering, as previousy stated, it was obviously necessary that some scheme would have to be devised to conduct and regulate the transit of trains with safety and reliability. But although our engineers thus early recognized the value of the semaphore signal, each preferred to supply his own contrivances for the railways under his command. Therefore there was very little similitude in design or action, but signals were variously modified according to individual fancies, and in some instances even carried to such extremes that similar signals on different railways had opposite significations.

On the first railway opened, the Liverpool & Manchester, in 1830, the signals were given by square or circular boards fixed at the top of poles, of sufficient height to insure their being easily seen. Figure 1, plate 73, represents a front and end elevation of such signal, in which the boards and the post, are capable of being turned practically round on a vertical axis. One side of the board was painted red implying danger, and was to be considered 'on' when placeed transversely, or at right angles, to the road, and 'off' or 'line clear' when turned half round, or parallel to the rails, presenting an end view to the driver of an approaching train The lamps for night signals were fixed to the board or post, receiving the same relative motion, and presenting respectively a red or white light. The signals were located on the left of the train.

On some lines no fixed signals were originally used, the traffic being entirely conducted by hand signals, but from the first, uniformity of color was observed. For example: on the Greenwich line only hand lamps and flags were employed, the signls being given by men situated at different parts of the road; which method proved as inefficient as expensive, and in 1845 the system was condemned as utterly useless. In windy weather when the flags were blowing in the direction of the train, the signals could not be seen at all.

But after this date flag signals combined with mechanical ones were considerably used, and often resulted in conveying conflicting intelligence, and causing many sad accidents.

The Great Western line employed partially rotating perforated disks, with a rectangular board below, fixed on the post at right angles to the disk. This arrangement is shown in fig. 2. The Lancashire & Yorkshire railway used signals consisting of two disks, situated on arms at right angles to the post, commonly termed "spectacle signals," and shown at Fig. 3.

In the meantime some of the Irish railways adopted a rotating pennant-shaped signal as represented at Fig. 4.

Figures 5 and 6 represent respectively the early signals used on the Black Wall and Grand Junction Railway. Figure 7 shows the class of day signal employed by the Southwestern Railway in 1840, in which the disks are capable of turning on an independent horizontal axis, besides turning bodily with the post on a vertical axis. In this case one signal controls both the "up" and the "down" line by the various positions of the perforated disk, the movments of the same being affected by a cord passing over a pulley. The respective signals given by the relative positions of the solid segment in the disk, will be readily understood by reference to the sketch. When the disk is turned round bodily with the post so as to present an end view, it signifies both roads are "clear." This kind of visible day signal is still retained on some parts of the line.

Somewhat similar signals were used on the Brighton Railway for governing the branch and shunting traffic. They are shown at Fig. 8. But the disks were not provided with an independent rotary moton as in the above case.

In the meanwhle a modified "spectacle" signal became much in vogue on the southern railways, and is represented at Fig. 9. The general design is exactly similar to those used on the Lancashire & Yorkshire, but on the Southern railways the posts were fixed, while the arms and disks at their extremities were capable of partial vertical rotation about a clear horizontal axis, through the intervention of ropes or chains passing over pulleys and actuated by levers.

Balance cross bar signals were next tried on the northern railways as shown at Fig. 10. And in 1841, the semaphore signal was introduced on our railways by Mr. C. H. Gregory. It rapidly superseded all other kinds of visible day signals, and maintains its superiority to the present day. Figure 11 represents the early semaphore signal, which consisted of two arms, capable of being radially raised or lowered through an arc of about 90 degrees; the left hand arm only concerned the driver of an approaching train, and when at right angles to the post signified stop or danger, when at an angle of about 45 degrees or half lowered, caution, and when almost parallel with the post, go ahead or line clear. The night visible signals were worked in concert with the arms by imparting radial reciprocating motion to a pivoted frame provided with bi or tri-colored glasses. The glasses were thus moved over the face of a fixed lamp presenting a red, green or white light, in accordance with the previously mentioned respective day signals.

These different positions of the arms for transmitting signals of intelligence were seen at a greater distance than any other previous signal. The arms were worked by stirrups, located in cabins, and the point switches were independently shifted. Semaphore signals actuated by passing trains, were tried on the North London Railway, but proved unreliable.

In 1842 a novel signal, invented by Mr. C. Hall, was introduced on the Eastern counties railway. It consisted of five leaves of fillets, each of different color, put together like a fan, each colored sector representing a different elapse of time, thus enabling the driver to know how long ago the previous train had passed that point. The arrangement is shown at Fig 1.

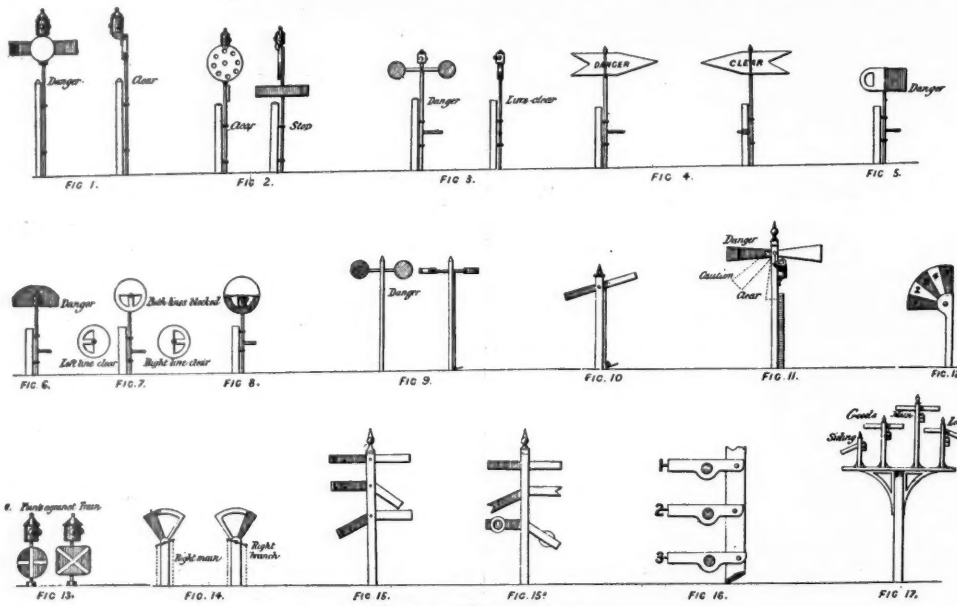
These visible mechanical time indicators were not found to answer long. A scheme for the same object had been devised and tried elsewhere, but was never successfully adopted. It consisted of a copper ball, which when placed at the top of a vertical guide post occupied about ten minutes in its descent, thus indicating by its relative height how long since a train had passed.

Mr. Whitworth, the well known mechanical engineer, provided the Lancashire & Yorkshire with a mechanical disk and gong signal for protecting trains during their transit through tunnels. By combining both visible and audible signals, the driver could not make a mistake.

Auxiliary or distant semaphore signals were next adopted for indicating, at intermediate positions of the road, how the home signals stood before sighting them, which signals were worked from the home cabins by levers and wires.

The early signals for indicating to the driver the position of the switches, were in most cases similar to those signals already described, with the exception of size, as shown in Fig. 13. Figure 14 shows a rather different switch indcator, used by the Southeastern Railway Co., for governing branch switches, in which a vertical radial arm was worked to the right or left by rods or chains.

*From a lecture by Mr. Arthur H. Johnson delivered before Lawrence Scientific School, Harvard University, Cambridge, May, 1894.



History of Railroad Signals.

"Plate 73;" with paper by Mr. A. H. Johnson.

It will be necessary here to break off from the elements of early 'out-door" signals to briefly review what had been going on in the cabins or "indoor" department.

Electricity having been so successfully introduced for commercial purposes, its utility and applicability to railway signaling was very soon obvious, and Messrs. Cooke and Wheatstone were the first to show us how to apply it, and obtained a patent in connection therewith in 1837. Their "indoor" electrical signaling instrument was really nothing more than what we now know as a galvanometer; it had five deflecting needles which served to indicate any required signals by a code of signs.

These gentlemen spent some time in trying to introduce it to the Liverpool & Manchester, and it was subsequently adopted by the Eastern Counties between Norwich and Yarmouth and afterwards by the Great Western line.

Until 1840, the line wires for connecting these and other similar electrical transmitting and receiving instruments, were insulated by a covering and placed in pipes under the ground, but it was subsequently discovered that the bare wires might be supported on poles in the open air, with glass or eathernware insulators, to prevent them communicating with the earth, through the poles, to which they were attached; thus attaining a great reduction of cost, superior insulation, greater permanency, and easy accessibility, the new system costing less than one-half the old. The wires are now usually galvanized to prevent corrosion. It is to Messrs. Brett & Little we are indebted for the introduction of earthenware insulators in connection with railway electrical signaling wires.

Having so far traced the "out" and "indoor" elements of early signals, we will now consider their combined working as a system.

The original method of signaling trains was to let the trains depart and then cover its rear by putting on the danger signal. After five or ten minutes had elapsed, the caution signal was given to a following train to indicate to the driver he might proceed cautiously. The caution signal having been kept on for five minutes the all right signal was given, implying the train had left about fifteen minutes previously, and that therefore the line should be clear. On the Liverpool & Manchester, the red light, or board, was kept on for three minutes after the train had departed, then the green light, or half-turned board for five minutes, thus giving a line-clear singal after the lapse of eight minutes.

It is obvious that this system could not guarantee at any time the line to be really clear, for although it could indicate how long a train had been gone, it could not show how far the train had traveled unimpeded in the time, and, therefore, there was always the risk of being caught up by a succeeding train and run into.

Not long after, Mr. Edwin Clark improved upon this very imperfect mode, and introduced to the London & North Western Railway the now well-known "block signaling system," meaning the maintenance of a definite and unvarying interval of "space" between trains, instead of time.

In 1852 Mr. E. Tyer made several improvements in this system, which were rapidly adopted by the London & Brighton, and subsequently by the South Eastern. This gentleman, with such other eminent electricians as Mr. Preece and Mr. Walker, have continued the work of improvement until we recognize the instrument of to-day.

It was not until 1856 that conflicting signals, or contrary positions of switches and signals, were prevented by the introduction of Mr. Saxby's now well known "interlocking system" in which an arrangement of mechanical obstacles rendered improper relative positions of the switches and signals impossible. Thus, by an ingenious arrangement of pins, working in slots, the position of the switches and signals of the most complicated junction were rendered safe and reliable. This principle has undergone continued improvement by Messrs. Saxby & Farmer, Chambers and others, until it has arrived at its present state of excellence.

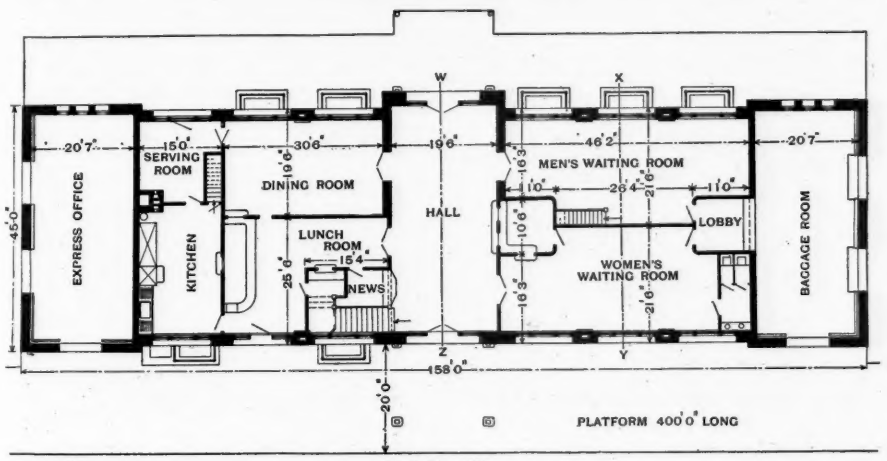
About 1860 Mr. Lankester invented and proposed a system of communicating motion to signals by means of hydraulic pressure, in which a piston acted on a solution of salt and water contained in pipes. Subsequently pneumatic pressure was suggested for the same object. Distant signals had been so constructed that the arms were pulled "up" by wires from the cabin and the expansion, contraction and breaking of the same was a frequent cause of accidents. Now they were provided with temperature compensatory gear and counterweighted, so that if the wires broke the arm at once flew to danger.

When the "block system" came into use the "caution" signal became generally discarded, as it was considered unnecessary. It was observed at Hatfield as early as 1856 that drivers not uncommonly passed caution signals at a rate of 35 miles an hour, and at Lewisham in 1862 many persons lost their lives through such negligence.

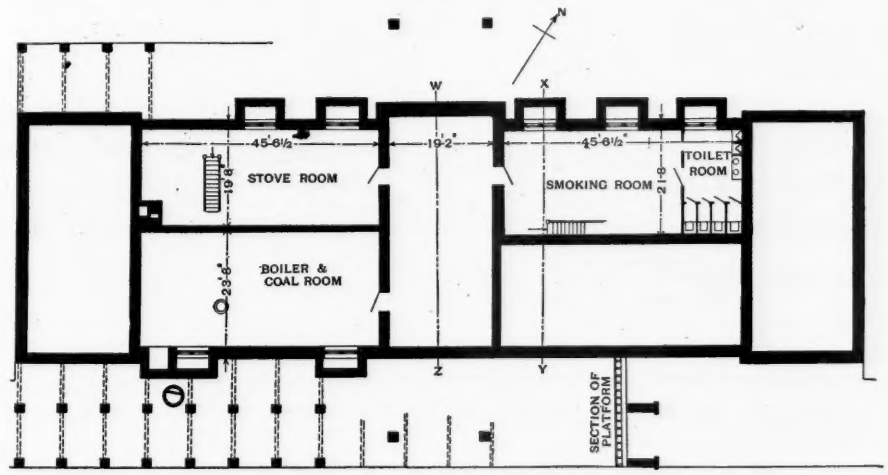
The foregoing passage from the *Railway Engineer* gives us a good idea of the early steps in signaling. Some notes on the progress in other features of the art will be given in a subsequent chapter.

[TO BE CONTINUED].

North Elevation.



First Floor Plan.



Foundation and Basement Plan.

Wisconsin Central Passenger Station, Ashland, Wis.

The Union Passenger Station at Ashland, Wis.

The accompanying engraving shows the general design of the Union Passenger Station recently erected at Ashland, Wis., for the Wisconsin Central Railroad Co., after the plans of Mr. S. S. Beman, Architect, Chicago. The station is used jointly by the Wisconsin Central Lines and the Northern Pacific Railroad Co. The building is constructed of Lake Superior brownstone, laid in random rubble with limestone water table and sills. The roof is of tile. The outside woodwork is painted olive. The inside woodwork is white pine, the basement and first floor being finished in oil and the second floor painted. The building is heated by steam from a small boiler in the basement, and lighted by electricity; light and water being supplied by the local company.

Ashland Station, East Elevation.

The arrangement of the main floor is clearly shown by our engraving, the baggage room being at one end and the express office at the other, and the intervening space occupied by waiting rooms, a hall, and lunch and dining-rooms. The upper floor furnishes room for various local offices of the company. The cost of the building was about $30,000.

The Liverpool Overhead Railway.

The directors' report for the first half of the present year has just been issued. The number of persons carried during the six months reached a total of 2,861,437; 277,653 first class, 1,246,975 second class, and 1,336,809 workmen passengers at special rates. These figures, as compared with the two previous half years—that is, since the opening of the line—show a steady increase. From March 6 to June 30, 1893, the total number carried was 1,370,742 (made up of 235,487, 956,922 and 178,333,) while for the second six months of last year the numbers were 2,475,639 (made up of 260,221, 1,293,840 and 921,578). These figures show the almost stationary character of the first class travel, with an actual dimunition in the second class, and a heavy increase (50 per cent.) in what corresponds practically to the third class. This is quite in accordance with the general experience on English lines where the three classes are still in use. During the past half year 50,483 trains have been run, making a total mileage of 265,349, as compared with 243,539 in the previous period. Punctuality has been well maintained with the automatic electric signalling system, 96 per cent. of trains being on time. Of the 7 miles 5 chains authorized, 6 miles 4 chains have been built and are operated; the rest is in hand with early expectation of being finished.

Turning now to the financial results, the gross receipts for the six months approximate to $100,000, whilst the working expenses are $74,735, giving a proportion of 74 per cent. as near as may be. This is the same as for the previous half, when the amounts were $91,710 and $63,660 respectively, so that no great saving of cost in working the line has been achieved. The proportion seems high, even for a short line with many stations. Although a greater train mileage has been made, yet the total expenditure on locomotive power is nearly 25 per cent. less than previously when the line was worked under contract at a fixed sum per train mile. The cost of fuel works out to .81 of a penny per train mile, and the total running expenses—including wages connected with the generating plant and motors, fuel, oil, tallow and other stores—do not exceed 2.73 pence per train mile, or say 5½ cents. Renewals and repairs under this head come to £157 only, say $785, making a total of £3,179, or $15,895.

By far the heaviest item in the total expenditure is put down to traffic expenses, which include all salaries and wages, station expenses, etc., and this amounts to nearly one-half of the gross expenditure. The sum named—£6,276 or $31,380—covers salaries and wages, fuel, lighting, signalling, water and stores, clothing, printing and stationery (tickets, etc.), and is 20 per cent. heaiver than for the preceding half. The net revenue—after paying interest on mortgage debentures and calls paid in advance—is sufficient with the balance brought from last half year to pay the full dividend of 5 per cent. upon the preference shares and a dividend of 1 per cent. upon the ordinary shares, with a balance of $5,000 carried forward.

The Liverpool Overhead line has thus taken a much shorter time to reach a dividend paying stage than the less fortunate City & South London underground, although for the past half year the latter has done so much better that its directors have also voted a dividend of 1 per cent. upon the ordinary shares instead of the ⅝ths of 1 per cent. hitherto divided.

Riveting Shop of the King Bridge Co.*

After the two old riveting shops of the King Bridge Co., Cleveland, had been destroyed by fire in May, 1893, it was decided to rebuild on a different plan, as the old shop had been found too narrow. The main dimensions of the new shop are 200 ft. by 320 ft. between centers of walls. The bottom of the roof trusses is 22 ft. above the level of the shop floor. The trusses, which are spaced 16 ft. between centers, are supported by pilasters in the brick side walls and by longitudinal riveted girders, 10 ft. deep, in the center of the building. These girders are carried by four columns, one every 64 ft., which latter form the only obstruction in the whole shop area.

The ends of the building are closed by brick walls of the same height as the side walls. Above these are trusses of the same capacity as the intermediate trusses, covered with corrugated iron, with glass windows. This construction admits of future extension at either end of the building at minimum cost.

The walls are of common brick, laid in lime mortar. They are 12 in. thick, with pilasters 20 by 24 in. On the outside the bottom is finished with an 8-in. stone water table and the top is corbeled flush with the faces of the pilasters, which are set out 4 in. from the face of the wall. Below the water table the brickwork is laid with cement mortar and plastered on the outside. Beneath these foundation walls is a sandstone footing course. The foundations for the center line of columns, which carry a maximum load of 136 tons each, are of sandstone. The pressure of the bottom plates of the columns is 265 lbs. per sq. in.

The roof is carried by 42 riveted steel trusses of 100 ft. span, supported as before noted. Their bottom chords form continuous runways from one side of the building to the other, except where the columns interfere. The trusses are designed for a horizontal roof load of 30 lbs. per square foot. In addition to this the first eight trusses, over the end of the building where stock is handled before assembling, are figured for a concentrated load of 5 tons at any point in the bottom chord and for the remainder of the trusses such a load of 10 tons is taken. The purlins are 6-in., channels spaced about 5 ft. apart. Each pair of main trusses is stayed laterally in the plane of the bottom chord by rods and struts. The top lateral bracing consists of rods in every fourth panel. The ventilator trusses have lateral bracings in the same panels as the main roof. The allowed working strains are 15,000 lbs. per square inch in tension and 14,000 lbs. in compression, the latter being reduced by proper formulæ. All material, except lateral rods and bolts, is of medium steel.

The roof is sheathed with pine planking, 1¾ by 6 in., matched and dressed. This is laid with joints up and down the roof and is fastened directly to channel purlins by 16-d. steel wire nails clinched under the top flange. This method has proved perfectly satisfactory. The planks were drawn together and down to the purlins as well as if they had been nailed to wooden purlins. The 45 degree slopes at the sides of the main roof and the quarter-pitch roof over the ventilator are covered with a layer of slater's felt and slated with sea-green slate. The main decks pitched 1½ in. per ft., are covered with a three-ply felt and gravel roof. This is fastened by nails every 10 in., up and down the roof, in rows 30 in. apart. The layers of felt are cemented with coal tar, and over the whole is spread a heavy coating of coal tar, in which is bedded a ½-in. layer of gravel.

The shop is lighted by windows in the walls, two to each panel, giving about 3,100 square feet of glass in the side windows. The sides of the ventilator are practically all glass. Each panel has four sashes, the two middle ones pivoted on a horizontal central axis. In the main decks are 20 skylights, 10 by 30 ft. each. At night the shop is lighted by 25 arc lights of 1,200-c. p. each.

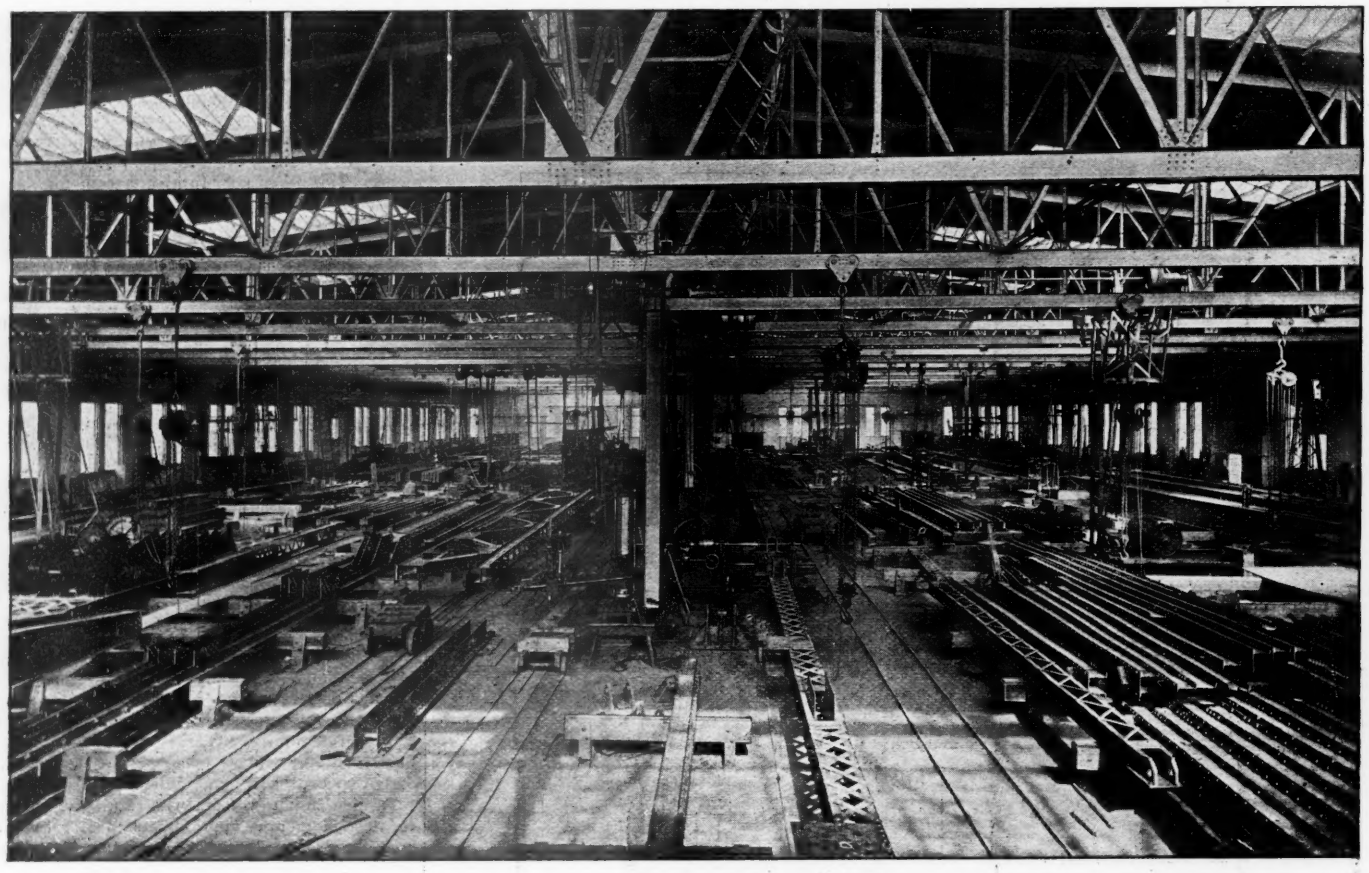
The corrugated and galvanized iron and wood work outside is painted with two coats of red iron ore paint and boiled linseed oil. The iron and wood work inside is painted with two coats of white lead and oil, with a faint tinge of blue. The brick walls are whitewashed. This white paint aids the lighting of the shop very effectually.

The bridge material enters the shop at one end and leaves it as completed bridge members at the other, with as little handling and moving, and especially with as little backward movement as possible. In each half of the building there is a distinct shop so completely fitted with tools that a bridge can be entirely built on one side without coming into the other. The overhead runways permit the easy transfer of work from one side to the other, if desirable. Work is moved longitudinally by means of buggies running on narrow-gage tracks on the ground. There are also tracks running transversely, with cast iron turntables at the intersections. Light jib cranes support and handle the material at the shears, punches, etc.

The method of driving the machines was carefully studied. Serious thought was given to the idea of equipping them with electric motors to be actuated by a generator connected with an engine which was already in place and which had not been touched by the fire. The scheme was abandoned principally for the reason that the cost of the electric installation was in excess of the estimated cost of shafts, pulleys, etc. The shafting throughout the shop is supported by cast iron hangers depending from girders composed of latticed channels. The latter rest on the bottom chords of the trusses, to which they are bolted. Two small upright engines in the shop can be connected to certain portions of the main shaft, other portions being thrown out of gear by means of clutches.

The shop was designed by Mr. Geo. E. Gifford, Assoc. Am. Soc. C. E., engineer of the company.

*Abstract of a paper by Geo. E. Gifford in the *Journal of the Association of Engineering Societies.*



King Bridge Company's New Riveting Shop, Cleveland, O.

Long and Short Indicator Connections.

In the *Railroad Gazette* of March 9, 1894, were given the results of some tests made by Professor Goss, of Purdue University, with long and short pipes connecting indicators with engine cylinders. The tests were made on the cylinders of the locomotive which was mounted in the laboratory of the university. A description of the conditions of the tests is repeated here, so that they may be more easily compared with data obtained from similar experiments on a stationary engine by another experimenter.

Professor Goss' experiments were made with both indicators attached to the same end of one cylinder of the locomotive. One indicator was connected as closely as possible, there being one indicator cock, a ¾-in. short nipple and a ¾ by ½-in. elbow between it and the cylinder head. The other indicator was connected by means of a ¾-in. short nipple, a ¾-in. elbow, 3½ ft. of ¾-in. pipe, and a ¾ in. by ½-in. elbow. The pipes were covered with asbestos paper and hair felt. Diagrams were taken simultaneously from both indicators, and the indicators were used alternately in both positions.

The conclusions arrived at were: (1) That at slow speeds the cards are practically identical. (2) As the speed increases a difference appears, which becomes quite perceptible at 212 revolutions a minute and pronounced at 320 revolutions a minute. (3) The mean effective pressure is increased by lengthening the connections. The article quoted said that Professor Goss was satisfied with the accuracy, but was not prepared to say what difference between diagrams might be expected from the use of long and short connections.

The appearance of this article, together with the discussion of the same subject, led by Professor Goss, at the March meeting of the Western Railway Club, has led many to suppose that the matter was entirely settled, and that there was no reason to question the above conclusions. It is much easier to present reasons in substantiation of such conclusions than to explain why the length of indicator pipe connections, within reasonable limits, should not affect the diagrams taken. That it is necessary to prescribe some limit will be acknowledged, because it is entirely possible to make the pipe of such length that the indicator will not be affected by the change of pressure in the cylinder.

Experiments which bear the stamp of very careful manipulation made on stationary engines by Mr. Edward J. Willis, of Richmond, Va., were described in the *American Machinist*, November 23, 1893, and June 7, 1894. They show that there is no difference in indicated horsepower shown by diagrams taken from indicators with long and short pipe connections, even though the difference in lengths of pipe be greater than in ordinary practice. The first series of experiments was made on an engine with cylinder 10 in. in diameter and 12 in. stroke of piston, and making about 310 revolutions a minute, about the same number of revolutions at which Professor Goss found pronounced differences. The load was steady and easily controlled. A 60-lb. spring was used in each indicator.

With this engine three tests were made. In the first there were 24 inches of ½-in. pipe and one ½-in. elbow between the cylinder and indicatorfor the long connection. In the second two more elbows and a ½-in. valve were introduced into the 24 inches of ½-in. pipe. In the third, 18 in. of ½-in. pipe, 6 in. of ⅜-in. pipe, a ½-in. valve, a ½-in. elbow, two ¾-in. elbows and a ½ to ⅜-in. reducer. The short connection in each case was made with only a two-way cock between indicator and cylinder. The results given in table No. 1 are averages of four sets of data each.

TABLE NO. 1.

Test Number.	Boiler pressure.	Revolutions per minute.	Mean Effective Pressure.		Indicated Horse Power.	
			Short Connection.	Long Connection.	Short Connection.	Long Connection.
1	80	312	29.36	28.93	21.8	21.5
2	80	313	24.64	24.84	18.4	18.5
3	80	313	27.14	27.05	20.2	20.1

The differences shown in the last four columns are so slight that it cannot be said whether they were caused by the difference in manipulation, or in the indicators, or caused by the difference in length of the pipe connections. From these not extensive, though careful and varied tests, it was concluded that the length of pipe connection did not affect the area of card. The only difference noticed

in the cards was that the expansion lines of the cards taken with the long connections were slightly wavy.

The question then was asked whether long or short pipe connections would affect the area of cards taken from a slowly running engine, and Mr. Willis duplicated the above experiments on an engine 13 in. x 18 in. cylinder, and running 90 to 130 revolutions a minute. In these experiments the first test was made with a short connection as before and the long connection of 4 ft. of ½-in. pipe, 4 elbows and a ½-in. valve. The results given are the average of eight readings. In the second test the long connection was made of three ½-in. nipples, one ½-in. elbow and 6 ft. of ½-in. steam hose. The results are the average of five readings. The results of the experiments with this engine are given in table No. 2. Fifty-lb. springs were used.

TABLE No. 2.

Test Number.	Boiler Pressure.	Revolutions per Minute.	Mean Effective Pressure.		Indicated Horse Power.	
			Short Connection.	Long Connection.	Short Connection.	Long Connection.
1	73	101	30.92	30.99	37.8	37.9
2	75	110	31.92	31.92	43.0	43.0

The experiments made by Professor Goss are limited in number, as are the tests made by Mr. Willis, and while the results obtained by the former seem to conform more closely to what has been the teachings for years, nevertheless Mr. Willis' experiments are worthy of sufficient consideration to leave the question of the effect of long and short indicator pipe connections still in dispute.

Improved Sleeping Car Berths.

In the evolution of the modern sleeping car so many improvements have been made that one would scarcely believe that anything remained to be done to perfect them. Much has been done to provide passengers with every facility for recreation, sight-seeing and business during the day, and for every comfort and rest at night. The Pullman Company has always been active in adopting improvements, and last year radical changes were made

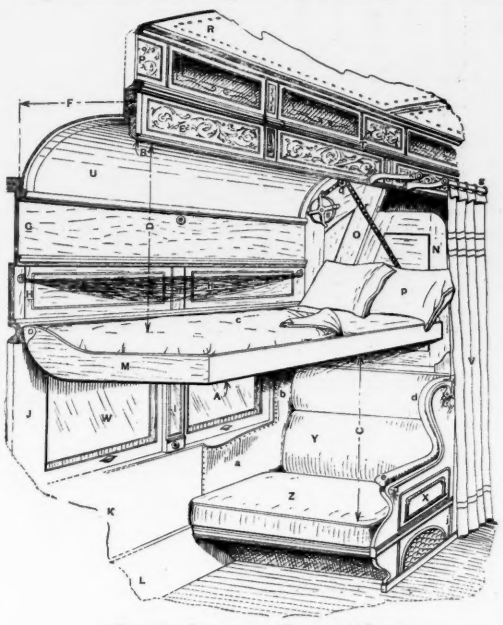


Fig. 1.—Common Type of Berth.

in the design of sleeping car interiors. Prominent among these were the new vaulted and curved roofs of the cars exhibited at the World's Fair, and many new designs introduced in decoration.

One change, perhaps minor when compared to some, but one that will spare passengers much discomfort, bruised bodies and hard feelings, as well as prevent harsh words, is shown in the sketch, fig. 2. It has been designed and patented by Mr. A. Rapp, the chief draughtsman of the Pullman Car Works.

A comparison of fig. 2 with the older type shown in fig. 1 will disclose the improvements, which do away with the sharp corners marked A and B in fig. 1, and the low heights, C and D. Occupants of both the upper and lower berths often bump their heads against these sharp corners. Fig. 2 shows how the corner, A, has been rounded and the bunk apron, B, has been cut short and square with the ceiling.

By the omission of the corner A and the bunk apron B, under the clere-story, other improvements were possible in three important details: First, a gain of several inches in the height between the upper and lower berth was made; secondly, a greater height, D, between the upper berth and the bottom of the clere-story; and third, the distance between the clere-story sides, E, was increased about 8 inches.

The advantages of the new arrangement will be appreciated by occupants of either the upper or lower berth.

When undressing one may sit erect in the bed and move about without injury either to car or cranium, and by the greater width of the clere-story the upper berth is made more open and agreeable and therefore more desirable. This new design has been patented by the Pullman Company, and is termed the Columbian style of berth.

The Corrosion of Iron Pipes by the Action of Electric Railroad Currents.

We give below a synopsis of a paper on the above subject, read by Prof. D. C. Jackson, of the University of Wisconsin, before the Western Society of Engineers at their meeting in Chicago on July 11.

The paper is based upon the investigations of two students working under the direction of Prof. Jackson. Their work was divided under two heads: First, to determine what chemical action really occurs under the conditions that are met in towns where corrosion of the water and gas-pipe systems have occurred through the action of electric railroad return currents. Second, to examine the action which has actually occurred in various towns, apply the deductions gathered from the results of the first division of the work, and determine the best methods of avoiding difficulty or danger from corrosion. Among the various towns mentioned where electrolytic action has been observed are Boston, Brooklyn, Milwaukee, Chicago, Zanesville, Ohio, Columbus, Ohio, Hamilton, Ont., and several others, some of which have been referred to in previous articles in the *Railroad Gazette*.

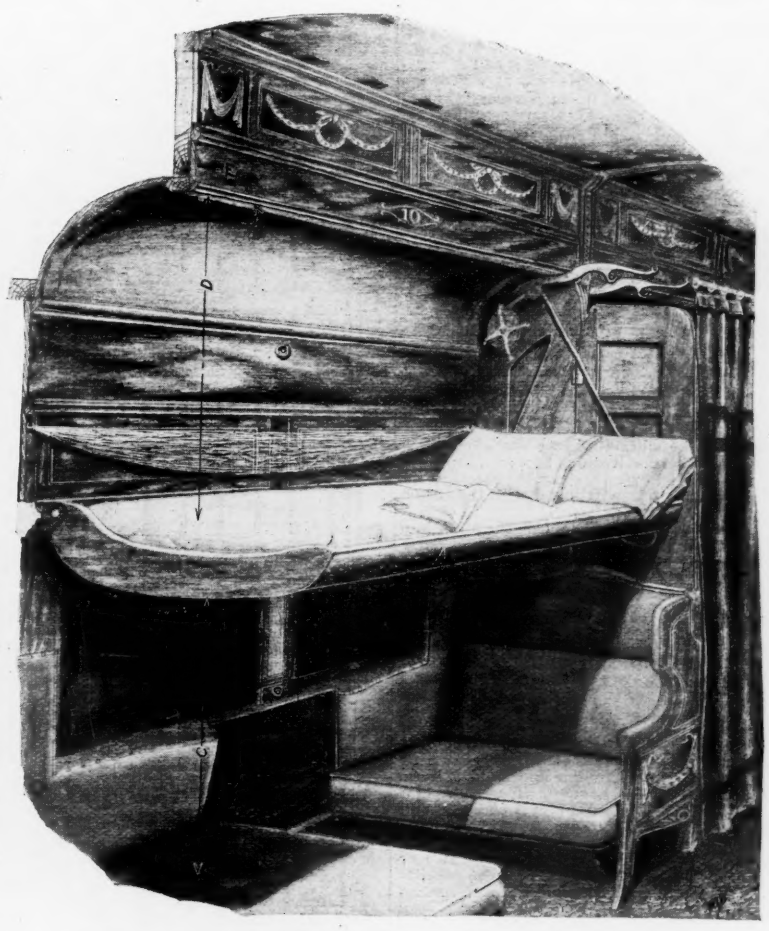


Fig. 2.—Improved Sleeping Car Berth, Pullman Palace Car Company.

The tendency which now obtains is to make the return circuit of fully as great conductivity as the supply circuit, without relying upon any conductivity from the ground. This is being accomplished by the rail-bonds and running heavy track feeders, or electrically welding the rails. There is little doubt that with a perfect return system, which is properly connected to systems of underground pipes, electrolytic disturbances will practically disappear in nearly all cities.

Two theories have been put forward relative to the corrosion: First, that it is simply due to chemical action caused by ammonia, saltpetre, leakage from gas mains, etc., found in the earth; second, that it is the result of electrolytic action. While simple chemical action undoubtedly has much to do with shortening the life of a pipe, it cannot, on the face of it, produce effects of the magnitude of these noted above. The ordinary life of water and gas pipes where chemical action alone is met, is said to be about 20 years, while the corrosive action with which we are dealing has destroyed new pipes in intervals having from a few weeks to half a dozen years' duration. In every case of the corrosion to which we refer, an electric current has traveled along the pipe and the corrosive action has taken place at the point where the current left the pipe. This is conclusive proof of electrolytic action. Secondary chemical reactions play an important part in the final decomposition of the pipe, and these are dependent upon the character of the salts in the soil, but the current sets the ball rolling. The electrolytic action of the current may occur by means of two processes—(1) direct electrolysis of iron, and (2) electrolysis of chemical compounds which are held in the water of the soil, setting up secondary chemical reactions at the electrodes. In order to have electrolysis at all, it is necessary to have the equivalent of an electrolytic cell. In the case of a current leaving a pipe at any point, the pipe is the anode or positive plate of such a cell, the wastes of the soil containing the chemical compounds in solution is the electrolyte, and the rail is the cathode or negative pole of the cell.

In order to have the first electrolytic action go on (that is, direct electrolysis of iron), a soluble iron salt must be present in the soil, reaching from anode to cathode. The analysis of street soils shows no such salts, and hence we are safe in concluding that this factor does not enter into the corrosion to any practical extent.

In order to determine as exactly as possible what occurs in the soil due to the return current, a series of laboratory experiments were performed, in which the practical conditions were reproduced as fully as possible.

Almost every chemical analysis of street soils shows the presence of some soluble salts of ammonia, potash soda, and because of their common occurrence, an experiment was performed to determine the effect of these salts on the electrolytic corrosion of iron plates per ampere hour. Experiments were also made to determine the effect of carbonates of calcium and magnesium in the soil.

The results of many experiments and the conditions of corroded water pipes as observed leads to the conclusion that under the conditions existing in street soils, the corrosion will primarily go on by virtue of the acid radicals of the hydrochloric, nitric, sulphuric and other acids, the carbonates held in solution by virtue of the carbonic acid acting merely to change the ferrous salts to the normal iron carbonates and the ferric salts to the ferric hydroxide. Should the carbonates in solution be electrolyzed in addition to the salts of the alkaline metals, the carbonic acid radical would not attack the iron, as the corrosive power of the other acids is so much greater, but would again form with the ferrous salts the iron carbonate.

Owing to the doubt which exists as to what minimum voltage is required to induce electroylsis of water pipes, a series of determinations were made by means of electrolytic cells. The following conclusions are drawn from the experiments made:

1. In no case is the action due to the electrolysis of water where oxygen is liberated at the anode, it does not attack the iron.

2. Only a mere directive force in the nature of a pressure will cause electrolysis.

3. The actual corrosion is therefore only dependent upon the actual current which flows, and is as much dependent upon the resistance of the soil as upon the pressure tending to cause the current.

4. Only a minute quantity of soluble salt is sufficient to start the action, and it will then continue as long as a current flows.

5. The gravity of a corrosion of a pipe depends on the amount of current flowing from a given area, and the nature of the salts present in the soil, the order of the activity of the salts being (1) chlorides, (2) nitrates, (3) sulphates.

Experiments were also made to show whether periodic reversals of current would prevent electrolysis. These were carried far enough to show conclusively that the minimum period of reversal during which corrosion goes on lies below 15 seconds, thus making the prevention of corrosion by reversals entirely impracticable.

The problem of preventing the destructive electrolytic effects upon iron pipes requires a careful study of the local conditions in each case before it can be satisfactorily solved. I am quite confident, however, after carefully studying many cases of corrosion and applying conclusions of these experiments, that there are very few places where the difficulty cannot be avoided at a comparatively small expense, and with a resulting advantage to the operation of the railroad. Some of the conditions that exert the most marked influence upon the corrosion are: the nature and amount of the soluble salts in the earth, the resistance of the earth itself in the locality, and the electrical pressure between rails and pipes. High pressure differences do not necessarily imply a high degree of action, as is shown by the condition of the Madison water pipes. On the other hand, with the favorable conditions of a low resistance path between the pipes and rails and a relatively large amount of soluble salts in the earth, there is no doubt that serious electrolytic effects may be produced

where a quite small difference in pressure exists between the pipe and rails.

The use of alternating currents which produce no appreciable electrolysis would avoid all difficulty, but their use for driving street railway motors is not, up to the present time, an assured success. The use of a double trolley system of conductors would also avoid the major portion of the difficulty, but I believe it can be equally well avoided by proper construction where the usual single trolley systems are used.

Investigations have shown that when the negative pole or the generator is connected with the trolley the pipes are positive to the rails over an extended outlaying district, and corrosion goes on over a large area, while with the reversed arrangement the dangerous area is concentrated about the power station. The latter method of connection allows the difficulty to be most easily handled, and after the district within which the pipes are positive to the rails has been accurately determined by proper voltmeter tests, frequent connections of pipes and rails should be made within its limits. This can usually be done at a comparatively small cost, the interest on which may be annually saved by the decrease of lost power if the connections are properly placed.

Steel Rails.*

A steel rail must meet so many conditions of service, some of which are diametrically opposite, that for all to be brought to the highest efficiency presents a very difficult series of problems. The quality of metal needed for our present service even for safety, is one of physical hardness combined with toughness, a solidity and firmness of texture, which will resist flow under the wheel pressures. When a new rail is placed in the track the bearing surface of the head undergoes cold rolling, breaking down the structure more or less, flow taking place. In physically soft rails the breaking down of the surface may be from $\frac{1}{64}$ to $\frac{1}{32}$ of an inch in depth, flow taking place until the entire limit of elongation of the metal is reached; and this forms a hard, thin, brittle layer of metal on the surface of the rail. The elongation of the metal under this thin hard layer is not affected, and the rail can bend downwards and take a set without fracture, but in case, from any condition of track, extension of the head should occur the thin layer of metal would break and with it the head of the rail breaks downward.

Many breakages of soft rails from the head downward occur, especially the inside rails on curves. Instead of soft rails being the safest, they are the opposite so far as breaking of the head downward is concerned, their freedom from breakage being due more to the high standard of track maintained. Breakage of rails under the indentations on the bearing surface of the head caused by broken wheels is often due to the fracture of the hard rolled brittle layer of the rail.

I have had two pieces from a John Brown 65-lb. 4½-in. rail of 1873 tested under a drop of 2,000 pounds falling 20 feet, supports 4 feet apart. The piece tested with base down gave a deflection set of 5.4 inches and 10 per cent. elongation per inch of the base which was directly, under the point of impact—still a very tough rail so far as the original metal was concerned. The piece tested with the head down broke without giving any elongation of the thin layer on the head. Remove this thin layer by planing it from the head or annealing it, restoring its former elasticity, and the rail will bend with the head down as when new.

Stiffness has not in this country received the attention the importance of the subject demands. It was not until after I had taken many thousand miles of diagrams of the condition of the best tracks in the country and analyzed the results that I was so thoroughly convinced of its importance. Ballast, ties or labor did not wholly suply its lack in the rail section.

In my design for the pioneer 80-lb. section for the New York Central in April, 1883, I made it five inches high for great stiffness, and gave it the broad thin type of head, which subsequent experience has shown to be the best. This has since become the prevailing type. With an increase of only 15 pounds of metal over the 65-lb. rail it was 60 per cent. stiffer; 44 per cent. stiffer than the Boston & Albany 72-lb. rail; 28 per cent. stiffer than the 84-lb. rail, 4½ inches high and 6⅜ in. base, of the Metropolitan Railway of London. It was the first 5-inch steel rail proposed for use in this country, and was bitterly criticised. Nearly one year was taken for its consideration by the railroad company, but from the mass of data shown by my diagrams I was able to answer all valid criticism, and it was adopted through the persistent efforts of Mr. J. M. Toucey, then General Superintendent.

The rails once in the track furnished ample proof of the great value of their stiffness. The Pennsylvania soon followed with a 5-in. 85-lb. rail; the Michigan Central with a 5-in. 80-lb. rail; and a 5-in. section became quite general.

The value of stiffness in rails was so well shown by the service of the pioneer 80-lb. * * * that in making the designs for my present series of standard rails I made the 75-lb. practically as stiff as the Pioneer 80-lb., and the new 80-lb. 11 per cent. stiffer.

In 1892 the New York Central adopted my 60, 65 and 70-lb. of series B, the 75 and 80-lb. of series C, and the 100-lb. of series E. Many thousand tons of these have been in service two years. The 80 and 100-lb. sections are used on the main lines under heavy traffic, the others on branch lines of lighter traffic. The main line has been entirely laid from New York to Buffalo and return with the pioneer 80-pound, the new 80-lb., and for a short distance the 100-lb. The New York Central was the first to introduce the stiff 6-inch 100-lb. rail in this country.

The most difficult requirement to meet is a quality of metal in the head which will carry the wheel load. We are obliged to deal with wheel pressures per square inch of contact from 80,000 lbs. on the small wheels to 150,000 lbs. upon the locomotive drivers, measured on rail heads 2¼ inches wide. * * * Within the limits of safety manufacturers have found no way by which they can produce a physically hard and tough rail in heavy sections of deep heads and light bases.

* * * As a result of many tests I designed my standard rail sections, distributing the metal so all of the heads could be made physically hard and tough, to check the excessive flow and wear as shown by most of the sections then in use. Experiments upon the thin head of the Pioneer 80-pound indicated that this could be done. In the meantime I had designed the 95-lb. rail for the Boston & Albany with its broad and thin head, the height of the section being limited by the company to $5\frac{1}{2}$ inches. Knowing that the difficulties of obtaining the requisite quality of metal increased rapidly as the weight of the section increased, I urged starting with a higher grade of metal in the ingot, and proposed the following chemical composition: Carbon .60, manganese .80 to .90, silicon .10 to .15, phosphorus not to exceed .06, sulphur not to exceed .07. This was in October, 1890. While great doubt was expressed as to the possibility of securing toughness with so high carbon, we were able to control the condition of the carbon in the final product of the rails, so that they were of unexpected toughness. The butts stood a drop test of 2,000 pounds, falling 20 feet and rarely broke, while hundreds stood two to four blows of 30 feet before failing, supports four feet apart.

On the side the flange gave 16 to 18 per cent. elongation per inch under the point of impact of the drop. To manufacture such tough high carbon rails cost $2 a ton more than ordinary rails.

I have no hesitancy in saying that it is the most important work yet undertaken to improve the quality of steel rails for the present service. The contract for the first 16,000 tons of the 95-pound rails was let to the Bethlehem Iron Company. Every effort was made by them to make the rails tough, and in this respect they were as agreebly surprised and gratified as anyone. The Lackawanna Iron & Steel Company have since manufactured over 150,000 tons of these high carbon rails.

Col. Katté, chief engineer of the New York Central, adopted the high carbon formula for rails. In 1893 I drew a complete specification for the manufacture of their rails, the composition being nearly as follows:

Weights per Yard, lbs.

	60, 65 and 70	75 and 80	100
Carbon	.45 to .55	.50 to .60	.65 to .75
Manganese	.80 to 1.00	.80 to 1.00	.80 to 1.00
Silicon	.10 to .15	.10 to .15	.10 to .15
*Phosphorus	.06	.06	.06
*Sulphur	.07	.07	.07

*Not to exceed.

In the specifications there is now inserted the following clause, which gives us an opportunity to control conditions which may occur from day to day in making rails:

"From the results of the inspection of the ingots, blooms, rails, and from the drop tests, the inspector for the railroad company in charge of making the rails shall have the right to select the minimum or maximum limit of either the carbon, silicon, manganese, or the three, as the general guide for the composition, as he may consider the finished product requires, to produce a tough rail with as dense, fine-grained heads as possible by the plant of the manufacturer."

Carbon has different forms or conditions in which it exists in rails, some of which are hard and tough, while others are hard and brittle. In rails it is important to have the carbon in the condition of toughness instead of brittleness. Brittleness is not necessarily due to silicon. From .04 to .06 of silicon has been the common practice, but it is not sufficient for present traffic. The early practice was far better, as .08 to .10 was used. Some of the earlier rails had from .30 to .40 of 1 per cent. of silicon, and low carbon .25 to .35, and the good wearing qualities were attributed to the silicon. The structure of those rails indicates, so far as I have examined them, that their methods of manufacture had much to do with the resulting structure which wore so well. This is, however, a matter which will require extensive investigation, and there are but few laborers in the field. One fact has been well demonstrated—that the ingots with our silicon content are free from blow-holes in the columnar structure. From many years of experience with high copper rails, it is not believed the ill effects once attributed to copper have been realized.

For our heavier wheel loads shall we make the bearing surface for the wheels and rails less or increase it? There would seem to be but one answer. I made the head of the Pioneer 80-lb. wide, and the results being so favorable I made the heads of the Boston & Albany 95-lb. rail and my 100-lb. for the New York Central 3 inches wide. The bearing surface between the wheels and rails is increased, and this prolongs the life of the tires as well as the rails. For tires this has been shown to be the case on the Hudson River division of the New York Central, the only place where the broad-headed rails have been in the track sufficiently long to wear out sets of driver tires. The wear of tires running on their former 65-lb. rail, 13,600 lbs. per driver, was about 19,400 miles per $\frac{1}{16}$ inch wear of a tire. Now on the 80-lb. rail, with 18,000 lbs. per driver, it is 11,300 miles per $\frac{1}{64}$ inch wear of a tire, but locomotives often run 140,000, 160,000, and one made 187,900 miles between the turning of the tires. The service of the locomotives is increased, and one now rarely goes to the shop for tires to be turned except other general repairs are required.

Increasing the width of the head also increases the angle of stability the same as adding the same width to the base. The rails must not only support the cars, but guide them by the flanges of their wheels.

A large top radius for the head of the rail is a matter of prime importance, especially for heavy and stiff sections. Locomotive drivers slip easier on the small top radius for rails than they do on the larger top radius, while on the latter the cars ride so much stiller the difference is remarked by passengers. A top radius of 14 inches is giving good results in service.

During manufacture, to facilitate securing the requisite physical properties of metal and mechanical finish of the rails, the metal should be distributed so the heat will be abstracted nearly as rapidly from the head as the base, especially during the last passes in the rail train. This means much more than balancing the section, so far as placing nearly equal percentages of metal in the head and base are concerned. To control so great an increase of heat in the rail head, and at the same time maintain the equality of the rail, is a complex problem. With the deep, massive heads of many sections the mills have not been able to maintain the quality, and it is only in the thinner, broader heads the quality has been approximated. Manufacturers are quite unable to do the impossible.

The rail from the finishing pass runs to the saws at a temperature which requires an allowance of 6 to 7 inches over the 30 ft. to allow shrinkage to 30 ft. when cool. This is about double the allowance which our tables of expansion in the books indicate. Which is correct? The rail from the saw runs through the cambering machine and is cambered—given a "sweep"—from 3 to 16 inches, so it will cool reasonably straight. The deep head and light bases require the most camber. From the cambering machine the rails run to the hot bed, where I have all rails spaced 6 to 8 inches, avoiding some of the camber which would be required if the rails were bunched. On the hot bed a striking phenomenon occurs.

I have prints of a section of the hot bed at the South Works of the Lackawanna Iron & Steel Company, illustrating the cooling of my 70-lb. section and the cooling of the West Shore 67-lb. section, having a deep head (see Figs. 1 and 2). In three to five minutes, while the general temperature of the rails is reducing, the rail

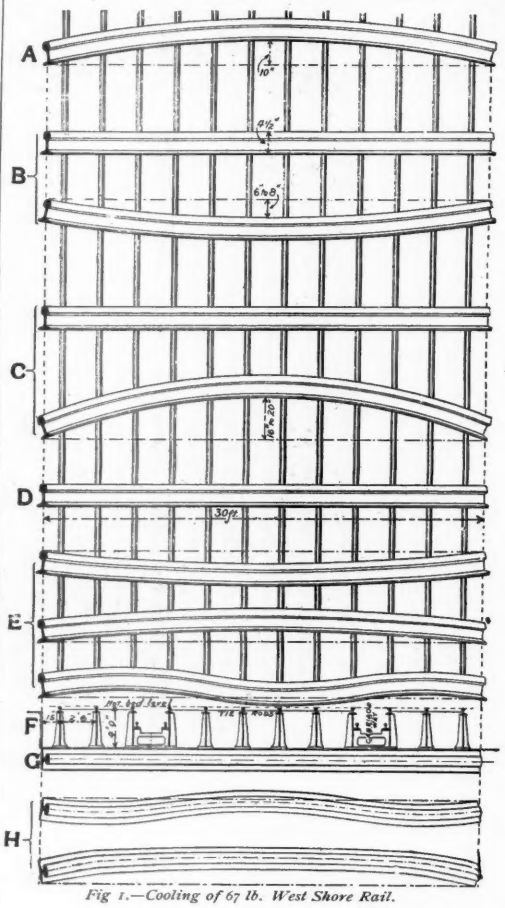


Fig. 1.—Cooling of 67 lb. West Shore Rail.

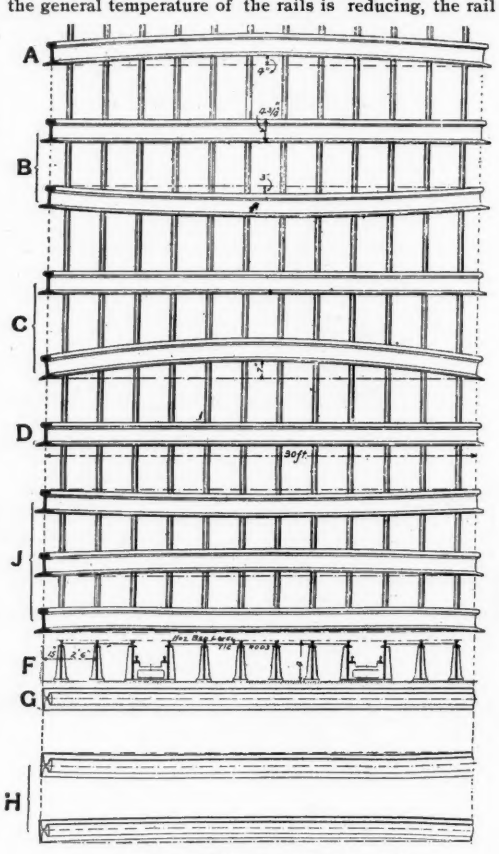


Fig. 2.—Cooling of Dudley 70 lb. Rail.

Cooling of Rails as Affected by Thickness of Head.

straightens, then the base curves around the head, nearly as much in the opposite direction as it was cambered in the first place. This is the recalesence of the base. In one to three minutes the rail restraightens—recalesence of the head—then the head continues curving around the base until the camber is much more than the original amount. This takes place in ten to twelve minutes, as a rule. Then, as the rail cools, in twenty-five to forty-five minutes it straightens, or practically so, for the third time. The rails with deep heads are quite irregular, for the most experienced man cannot always judge as to the correct temperature of each rail and adjust his cambering machine.

I have also prints (see Fig. 4) of the comparative curves of radiation of heat from the head and base of old pattern New York Central 65-lb. rail, with a deep head, and their new 80-lb. and 100-lb., and the Boston & Albany 95-lb. rails, in which the recalesence of the base first, then the head of the rail may be traced. In the old style 65-lb. rail the comparative temperature of the head to the base is much higher than in the heavier sections with a better distribution of metal. This greater comparative difference of temperature between the two styles of sections may seem a trifling matter, but it is one of those important details which controls, to a large extent, the subsequent physical quality and mechanical finish of the rails.

Rails which require so much camber are not likely to leave the hot bed without large vertical curves, while those on the side will be very marked, for a level hot bed does not conform to their constantly changing curves, nor is it easy to conceive how one could be designed.

To take the long curves or side bends out of a rail the blows under the straightening press must be sufficient to

*Extracts from a paper read before the Scranton Engineers Club, Scranton, Pa., May 19, 1894, by Mr. P. H. Dudley, C. E.

give the rail a permanent set. If the blow must be heavy to do the work, the rail will be kinked under every blow. This has been the case with all deep-headed rails. The roughness of the track increases rapidly after their introduction. In my inspections I have found that most of the short waves in the surface of the rails were due to the excessive work of the straightening presses. I had the anvil blocks lengthened, the supports being placed further apart, reducing the force required to straighten the rails. This, together with proper design of sections, has reduced short waves in the rails to a marked extent. With smooth, well-finished rails the trackman can surface a 5-in. rail so the average sum of uculations per mile is about 2 feet and 9 inches. If the rails are wavy the sum will rise, reaching 4 or 5 ft. per mile, the track riding very rough, a condition which cannot be improved by the trackmen.

DROP TESTS OF WORN RAILS.

The following tests were made on May 19 with two pieces from the same rail, one with the head down to see whether the hard layer on the surface would give any elongation under impact before breaking. All worn rails tested up to that time had undergone extensive flow, and the measurements for elongation per inch were only made to the $\frac{1}{100}$ of an inch, and no elongation was observed. I have made the measurements for elongation to the nearest $\frac{1}{10000}$ of an inch. Six inches of the rail, either head or base, were stamped off in inch spaces, and the values of each determined before and after testing.

Fig. 3.—Sections of Rails Tested by Mr. Dudley.

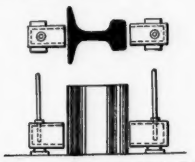


Fig. 5.—Arrangement of Centigrade Thermometer for taking Temperature of Rails on a Hot Bed.

All of the rails had been in service on the New York Central from 10 to 20 years, and were tested under a drop of 2,000 pounds, falling 20 ft., supports 4 ft. apart on centres.

Cammell Rail, "Toughened," 1867. No flow apparent.

1st inch elongated	.0509	of an inch
2d " "	.0543	" "
3d " "	.0625	" "
4th " "	.0582	" "
5th " "	Broke	
6th " "	.0713	" "

John Brown Rail, 1872. No flow.

1st inch elongated	.0590	of an inch
2d " "	.0770	" "
3d " "	.0794	" "
4th " "	.0771	" "
5th " "	.0815	" "
6th " "	.0897	" "

Barrow Rail of 1872.

1st inch elongated	.0015	of an inch
2d " "	.0042	" "
3d " "	.0073	" "
4th " "	.0083	" "
5th " "	Broke	
6th " "	.0068	" "

Cammell Rail "Toughened," 1881, soft decided flow.

1st inch elongated	.0000	of an inch
2d " "	.0005	" "
3d " "	.0015	" "
4th " "	Broke	
5th " "	.0028	" "
6th " "	.0030	" "

Troy Rail, 1881, decided flow.

1st inch elongated	.0015	of an inch
2d " "	.0070	" "
3d " "	.0055	" "
4th " "	Broke	
5th " "	Marks injured.	
6th " "		"

The cooling of 60-ft. rails is still more difficult than 30-ft. rails. The middle ordinate for a well balanced

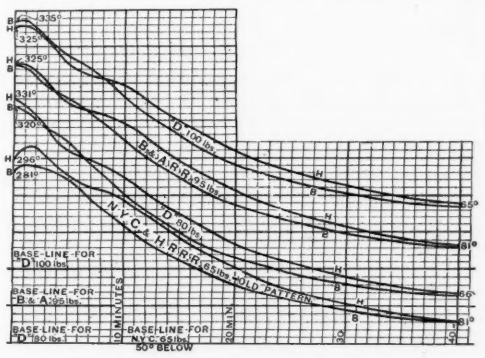


Fig. 4.—Relative Rate of Cooling of Head and Base of Different Sizes of Rails.

5-in. 60-ft. rail would be about 3 feet, when first cambered, and increased when the head cambers around the base. Many changes will be required in the mills to turn out good smooth 60-ft. rails.

ILLUSTRATIONS.

Figs. 1 and 2 have been prepared by Mr. Dudley to show the improvement in cooling that may be effected by balancing the rail section. Fig. 1 shows how the West Shore 67-lb. rail cooled, and Fig. 2 shows the same for the Dudley 70-lb. rail. The West Shore rail is 4½ inches high, with a deep head. Its base is 4½ in. wide, and the web at the thinnest part is $\frac{15}{32}$ in. thick. The metal in this rail is distributed as follows: head 51.04 per cent. web 16.87 and base 32.09. The Dudley rail is 4¾ in. high, with a thin head. The web at the thinnest part is $\frac{17}{32}$ in. thick. The metal in this rail is distributed as follows: head 40.6 per cent., web 22.7 and base 36.7. The two sections can be roughly compared by the sketches in Fig. 3, the left-hand sketch being the West Shore and the right-hand the Dudley rail.

The letters in Figs. 1 and 2 give the following indications: A—Rail as cambered by machine after leaving the hot saw. B—Recalesence of base. C—Recalesence of head. D—Ideal surface cooling to which a majority of the rails approximate. E—Common types of actual surface cooling. F—Cross section of nearly half of hot bed. G—Ideal side cooling. H—Types of actual side cooling. J—Rare types of actual surface cooling.

The vertical scale of the drawings, Figs. 1 and 2, is, for the camber, twice as great as the horizontal scale, and for the rail itself four times as great.

The diagram, Fig. 4, shows the record taken from thermometers used in testing the cooling of four different sizes of rails, to determine how closely the rate of cooling in the head agreed with that in the base of the rail. The space between each two vertical lines represents one minute of time, and that between each two horizontal lines represents two degrees Centigrade. The observations for temperature were in each case begun about two minutes after the rails were cold. A special Centigrade thermometer was used, with nitrogen over the mercury. The bulbs were enclosed in sheet-iron hoods so as to expose equal surfaces of the rails, as shown in Fig. 5. The bulbs were 3¼ in. from the rail. In the drawing B indicates the lines for the bases of the rails and H those for the heads. At the point of beginning (at the left of the diagram) the base was cooler than the head in each case, except in that of the 100-lb. section. The figures on the right of the diagram show the temperature for the base of the rail only.

The Railroads of the United States in 1893.

Advance sheets of the introduction to Poor's "Manual" for 1894 are received, giving statistics of the railroads of the United States for the year 1893. We give below a few of the figures:

Length of track laid up to December 31, 1893	177,753.36 miles
Completed to the close of the fiscal years of the respective companies	175,441.77 "
Net increase of mileage of all railroads in the United States in the calendar year 1893	2,549.26 "

LIABILITIES AND ASSETS OF THE COMPANIES OWNING THE ABOVE 175,441.77 MILES OF LINE.

Liabilities.	
Capital Stock	$5,080,032,904
Funded Debt	5,570,292,613
Unfunded Debt	410,361,503
Current Debt	383,201,872
Total Liabilities	$11,443,888,892
Assets.	
Cost of Road and Equipment	$9,661,713,736
Real Estate, Stocks, Bonds, and Other Investments	1,698,306,963
Other Assets	248,945,157
Current Accounts	247,002,310
Total Assets	$11,855,968,166

(The mileage, liabilities, and assets of elevated railroads are included above.)

STATISTICS OF OPERATION, FISCAL YEAR 1893.

Miles of Railroad Reporting (exclusive of elevated railroads)	173,370.67
Passenger Train Mileage	340,352,211
Freight Train Mileage	531,340,754
Mixed Train Mileage	17,751,928
Total Revenue Train Mileage	889,444,893
Passengers Carried	628,965,973
Passengers—Mileage	15,246,711,952
Tons Freight Moved	757,464,480
Tons Freight Moved One Mile	90,552,087,290
Earnings:	
Passenger	$311,978,342
Freight	808,494,668
Other	88,168,488
Elevated Railroads	13,976,792
Total Traffic Revenue	$1,222,618,290
Operating Expenses	858,027,181
Net Earnings	$364,591,109
Other Receipts, including rentals received by lessor companies	111,288,482
Total Available Revenue	$475,880,041
Payments from Available Revenue:	
Interest on Bonds	$239,616,284
Other Interest	7,123,246
Dividends	95,337,681
Rentals, Tolls, etc.	64,712,868
Miscellaneous	38,288,761
Total	$445,078,840
Balance.—Excess of Available Revenue over actual Payments therefrom for the year	$30,801,201

(The liabilities, gross and net earnings, interest and dividend payments, etc., of the elevated railroads in the State of New York are included in the above table. The earnings of these lines are derived chiefly from passenger traffic, but their earnings cannot be included under that head for the reason that, if included, the deductions from the totals thus arrived at would be misleading. The statistics of passenger traffic and train mileage are omitted for the same reason.)

The rolling stock equipment in the two years was:

	1893	1892
Locomotive Engines	36,012	34,626
Cars—Passenger	27,169	24.604
Baggage, Mail, etc.	7,805	7,830
Freight	1,161,282	1,117,728
Total Revenue Cars	1,196,256	1,150,162

The receipts per passenger-mile were the lowest ever recorded, having been 2.046 cents. In 1892 they were 2.168 cents. The receipts per passenger were also lower than in any preceding year, but the receipts per passenger train-mile were higher than in any year since 1889—that is, they were 91.66 cents, and the passenger earnings per mile of railroad worked were the heaviest since 1884, having been $1,799. The number of passengers carried per mile of railroad worked was 3,627, an increase of 250 over 1892. The average journey was longer than in any year since 1888, having been 24.24 miles. The average train load was heavier than in any year since 1886, having been 44.8 passengers. Of course we see in these passenger statistics the effect of the World's Fair—that is, it is perceptible in the increased earnings from passengers, notwithstanding the decreased rate per passenger mile.

The freight rate per ton-mile was also the lowest ever recorded, having been 0.893 as compared with 0.941 the preceding year. The average freight train load, however, was higher than ever before, having been 170.42 tons, and the average haul was longer, namely, 119.55 miles. Therefore, the receipts per ton and per freight train-mile were fairly good. The earnings per mile of raiload operated were heavier than in any other year since 1883, having been $4,663. The percentage of expenses to earnings was 70.42; the year before it was 70.40, and in 1891 68.83. And so it creeps up from year to year as rates fall. The total dividends paid amounted to 1.86 per cent. on all stock, and the total payments of all sorts on stock, bonds and floating debt amounted to 3.02 per cent. These figures are likely to be different in the statistical report of the Inter-State Commerce Commission, whose percentages of dividends and interest paid are always higher than Poor's.

The Resistance of Materials Under Impact.

The American Association for the Advancement of Science is holding its annual meeting in Brooklyn this week. On Thursday evening Professor Merriman, Vice-President and Chairman of the Section of Mechanical Science and Engineering, delivered as his annual address an important paper on the "Resistance of Materials Under Impact." A short abstract of the paper follows:

The importance of taking into account the effects of falling bodies, phenomena liable to occur in machinery, on bridges, and even in buildings, was dwelt upon, and then an account was given of the history of the development of knowledge on the subject. The subject was divided into two parts, "elastic resistance" and "ultimate resistance," the former being the case where the elastic limit of the material is not exceeded, and the latter where rupture occurs. The conclusions on elastic resistance under impact are derived mainly by theory, and teach that a sudden force produces twice as much elongation and twice as much stress as a force slowly applied. The conclusions on ultimate resistance under impact are derived by tests made with a falling ram, and these in general give different laws from those of the case of pure elasticity.

The development of the modern methods of static testing in the United States begun by Wade, Rodman and Plympton, the later testing machines of Fairbanks, Olsen, Riehlé and Thurston, the culmination in the precise apparatus of Emery and the powerful machine at Phœnixville were described. The results obtained from these tests, it was thought, did not give as full information as is desirable. The cold-bend test was characterized as of great value, and one that no engineer would desire to see abandoned.

The discovery of Kirkaldy that contraction of area is an important element in judging the quality of material was mentioned as a valuable one. The impact ram or hammer was discussed at length, as also the conditions for obtaining the best results by its use. The experiments of Maitland in 1887, of Estrada in 1892, and those now being carried on at Scranton by P. H. Dudley, were described, and the results derived from them critically analyzed. Impact tests of steel rails are now required to be made at the mill by at least three important railroads, a ram weighing 2,000 pounds, falling through a height of 20 ft., being used. Such tests promise to give important conclusions regarding the influence of temperature, of chemical composition and of methods of manufacture, and thus to lead to a better, more uniform and cheaper product. The discovery of Goss in 1892, that the driving wheels of a locomotive lift up from the rails during a part of each revolution, when running at a high speed, shows that impacts are of more common occurrence than generally supposed, and to satisfactorily resist these an increased resistance is required in wheels, rails and bridges.

The violent impacts produced by the explosion of dynamite, and by projectiles striking against armor plate, were briefly discussed, and it was stated that the indications are that in the conflict for supremacy between projectile and plate the former has the better chance for ultimate success.

A number of paradoxes or misunderstandings regarding the pressure caused by impact, and the relation between stress and work were reviewed, and most of these were shown to have had their origin in a lack of clear conception and correct application of the principles of mechanics. In view of the lack of precision which is frequently apparent, it was urged that greater attention should be given in technical schools to experiments and numerical computations of physical phenomena. The discussions of Herbert Spencer regarding laws of persistence of force and of continuity of motion were characterized as inexact, and it was claimed that the law of conservation of energy should be made the basis of all dynamical investigation.

In concluding his address, Vice-President Merriman said that the increasing interest in impact tests in all parts of the world was an evidence of the growing appreciation of the importance of the subject. He quoted Sir Benjamin Baker and others as testifying to the importance of impact, and expressed the hope that in a few years methods may be devised by which full information regarding all the physical qualities of materials may be obtained by simple tests of their elastic and ultimate resistance.

TECHNICAL.

The Siemens-Halske Company.

The proper court at Chicago has issued an order permitting the assignees of the Grant Locomotive Works to lease the plant of that works to the Siemens-Halske Electrical Co. for $12,000 a year. It will be remembered that the Siemens-Halske Co. was burned out a couple of weeks ago in the great lumber yard fire. The Chicago papers think that the new arrangement is part of a project for a combination of the Siemens-Halske Co., the Wells & French Car Co. and the Grant Locomotive Works.

Philadelphia Ship Canal.

The commission appointed by the Mayor and Council of Philadelphia to consider the matter of the ship canal has appointed its engineers. They are Professor L. M. Haupt, engineer in charge of surveys, and Major N. H. Hutton, of Baltimore, as consulting engineer. These gentlemen have accepted, and have been requested to begin the consideration of their work at once in order to make an early report to the executive committee.

The Berlier Electric Railroad.

The Berlier electric tubular tramway which was proposed some time ago as a partial solution of the rapid transit problem in the French capitol, is being talked of with renewed interest by Paris journals. As previously recorded in the *Railroad Gazette*, it has received the approval of the commission which was appointed to examine into its merits.

RAILROAD GAZETTE

EDITORIAL ANNOUNCEMENT.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The conscientious railroad manager who knows his subordinates and appreciates their fidelity to duty, must often regret his inability to suitably reward individuals for the special exertions which they must sometimes make in the course of their duties. As in all other employments, an unusual run of business, an accident, or severe stress of weather, may so increase the strain on a man's mind and body as to make his ordinary pay seem as nothing, compared to the service rendered. The recent experiences of faithful railroad men at Chicago (and elsewhere) are marked examples of what we are speaking of. We have already printed letters showing how this fidelity to duty was appreciated by the employers; but, as intimated by the New York *Evening Post*, the absence of a material token was noticeable in them. The railroad managers who sent the letters did not feel authorized to present a gold watch to each of their faithful employees, or even a $5 bill. This, as we have said, is more painful to the manager, than it can possibly be to anyone else. But railroad corporations are established to do business under the stern laws of the business world; and the manager, besides being hampered in many cases by a lack of money as absolute, from a true economic standpoint, as that which afflicts the tramp who cannot pay for a sandwich, is often prevented by the fact that he is acting for a *corporation* and not for a *man*, from making precisely the best use of what money he has And so, the sincerity of the manager whose letter of thanks is not accompanied by a $10 or a $100 bill is no more to be questioned than that of the one who does enclose such a remembrance. Moreover, every properly constituted railroad employee, realizes that the gratitude, without the money, is much better than money without the thanks could possibly be. Still, the manager who *can* give material testimony to his good wishes is to be congratulated, and it is our pleasure to print herewith a letter from such a one, recently received by a large number of the employees of one Chicago road. It is as follows:

> MY DEAR SIR: The faithful and loyal service rendered by you to this company, and through it to the public, during the recent troubles in Chicago, when not only loyalty, but personal courage was necessary, deserves especial commendation and approval, and I desire to tender you the thanks of this company, as well as those of myself, for your courageous attention to your duties, under most trying circumstances.
>
> As a slight recognition of this faithful service, it will give me pleasure if you will accept the enclosure which Mr. —— will hand you.
>
> I am, yours sincerely,
>
> GENERAL MANAGER.

The writer of the letter withholds his name, doubtless on account of the considerations which we have mentioned above; but as an item saying that these letters contained sums of money from $100 downwards, has been published in some of the daily papers, we have no doubt that the reader can guess who it is, if he tries hard. And it is still in order to recommend to all roads, that the suggestion of the *Evening Post*, quoted last week, be carefully considered at directors' meetings.

The proceedings brought for the forfeiture of the Pullman Company's charter are so baldly *ad captandum vulgus* (if we may air our district school latin of forty years ago) that we do not feel like treating them seriously. Governor Altgeld, of Illinois, and Mayor Hopkins, of Chicago, have shown themselves assiduous courtiers of that fleeting and dangerous popularity which is to be got in some communities, by any assault on any corporation. Naturally, a good many others like them are in high office in Illinois, and just now the Pullman company is fair game for all the demagogues of the country, including some venerable senators of the United States. But the Illinois courts are still uncorrupted by the poison which has had such a bad effect on the politicians of the state, and we doubt if the Pullman company will suffer anything more than a temporary inconvenience from this absurd suit, if it suffers even that.

The Effect of Valve Travel on Efficiency.

A correspondent inquires about the effect of long valve travel on the economy of locomotives, the reason of the question being a statement that increasing the valve travel makes an engine "smarter" but "wasteful of fuel." Before replying to our correspondent's inquiry it is well to understand that no one knows from actual *tests* whether a long valve travel or a short one is more economical; though common sense and experience with stationery and marine engines teach that the better the steam distribution, the less the back pressure during exhaust, and the less the drop of pressure during admission, the more economical will a steam engine be. This is the line that designers have followed in trying to improve the locomotive.

Those who have investigated the effect of increasing the valve travel on a link motion model know that the longer travels give a greater port opening for the admission of steam than can be obtained with a short valve travel at the same point of cut-off; also the long travel keeps the exhaust port open longer, and the compression, which is almost always too great in locomotives, is reduced. One important effect of the long travel is the increase of power of the locomotive at a given cut-off, and an engine that has been run, for instance, at a 6-inch cut-off with a 5-inch valve travel will be smarter, will haul a heavier train and run faster at the same cut-off when the valve travel is increased, say to 6½ inches. The reason for the increased power and speed is simply that the freer admission of steam, and the reduced compression give more effective pressure in the cylinder; this change makes the engine more powerful; it can do more work at a higher speed. The result of the better steam distribution is two-fold, viz.: the more economical use of steam and an increase of cylinder power. But it is not to be expected that the gain in efficiency will be sufficient to enable the engine to do the increased amount of work without something like a corresponding increase in the amount of steam used. To some extent the increase of efficiency will permit more work to be done with the same steam, but the increased capacity, if used, will demand much more steam in addition than will be saved by the increased efficiency, and if a locomotive is to be run to its full capacity at any given cut-off, say 6 inches, both before and after the valve travel is changed, it will be found that more steam will be required with a longer travel, and more work will be done; but the steam used per unit of work will be somewhat less with a long travel.

Now it may be that the engine records, which are always imperfect, and we believe it is safe to say never show the true comparative efficiencies of engines, show that an engine with a longer valve travel uses more steam per train mile; but this is easily accounted for by the fact that the engine with a long travel, being smarter, and having more capacity does more work and either hauls a heavier train or hauls the same train at a higher maximum speed; or in some other way the increased power is used and the engine does not get credit for it, and, therefore, it is apparently less economical. If there are many stations or stops, and the maximum speed is increased because the engine is smarter, there will be considerable increase in the power used in accelerating the train to the higher speed, and more power will be lost in the brake shoes when they are applied to stop the train. Attempts to make high maximum speed with a train that is frequently slackened for signals or stops will always be followed by an increase in fuel used per train mile, owing to the increase in the amount of power required to accelerate the train.

The most economical run, so far as steam is concerned, is a uniform one, in which the brake shoes are not applied to the wheels between terminals. It is this loss of power in acceleration that raises the fuel used per train mile in elevated railroad service with a 150-ton train to the same amount that is used in some through runs on surface lines with 350-ton trains. For reasons such as these the "smarter" engine with longer valve travel may, because of the greater power and flexibility, be run so irregularly as to be, according to the prevailing imperfect engine records, more "wasteful of fuel," and this is about all there is to the whole matter. We must admit that shop tests under constant conditions will alone give reliable data.

Any one familiar with steam distribution with the Stephenson link and under the conditions of locomotive operation knows well that the recent improvements in dimensions, viz., increased valve travel and outside lap, and the use of inside clearance instead of lap, give not only greater power, but better steam distribution and higher efficiency, for this has been proved beyond all question by a multitude of experiments with stationary and marine engines. Only those believe to the contrary who have not made accurate investigations. The increase in efficiency which accompanies the increase in valve travel is small, but the increase in capacity to haul trains is considerable, and it is not to be expected that the increased capacity can be utilized without a greater supply of steam and a corresponding increase in the fuel used. The reason why a 4½-inch valve travel makes an engine "lazy" is simple; the steam is what pushes the piston and makes the engine go, and the less the pressure of steam and the more it is wire-drawn and choked, the less "go" the engine has. With a 4½-inch travel the steam is choked, with a 6½-inch travel the action is freer.

Regarding the Rhode Island Locomotive Works engine built several years ago with long travel, viz., the engine "Miller" on the N. Y., P. & B., now part of the New York, New Haven & Hartford some untrue things have been said because of prejudice at the time the engine was built. This prejudice has since been removed. The changes made in the engine "Miller" to satisfy a local master mechanic did not change the conclusions of the Rhode Island Locomotive Works about long valve travel, and that company has never hesitated in the introduction of the long travel on all important engines since the extensive investigation made of the comparative effects of different dimensions of valve motion details before the "Miller" was designed, and many engines have since been built by the Rhode Island Locomotive Works with long valve travel.

It is not generally known that the engine "Miller" as originally built was never tested in competition with other engines, owing to local feeling against engines with high boilers and considerable weight on four drivers. The boiler of the "Miller" was not higher than other locomotives built before, and not nearly so high as the Wootten type, many of which were running before the "Miller" was built. The weight on drivers was that now commonly used for eight-wheelers, and was not greater than that of other engines running at the time. A rear carrying wheel was added and a false valve seat was put on and the valve travel and port decreased because the engine "handled" hard, the makers of the patent balanced valve having made a mistake in the balancing. The valve makers refused to take the responsibility of using the large amount of balance called for by the Rhode Island Locomotive Works, which was the amount now commonly used for large valves, and they reduced the balance. As a consequence the reverse lever was hard to move, and the master mechanic reduced the size of the valve instead of increasing the balance. In this way the "Miller" finally became a freight engine of a mongrel type, and is now neither a good freight engine nor a good passenger engine; and what was originally a design embodying the most advanced principles in use at the time by some of the more progressive railroads, and which have now become best common practice, has become, because of temporary local prejudice, a very unscientific locomotive.

The "Miller" was not the first locomotive with long travel of valves and wide outside lap and inside clearance, as such were used for a considerable time before by the Philadelphia & Reading Railroad as a result of the investigations of Mr. L. B. Paxson, Superintendent of Motive Power, and Mr. Samuel Prince, Mechanical Engineer of the Reading at that time, and now Master Mechanic of the Long Island Railroad.

Massachusetts Highways and the State.

An important economical experiment is going on in Massachusetts which has attracted little attention outside of that state. In 1893 an act was passed to secure aid from the state in making local roads, and this was modified by another act, June 20, 1894. As the law now stands, it provides for the appointment, by the Governor, of three highway commissioners,

holding office for three years; but the three first appointed retire in different years, so that the board may be changed gradually. By the act of 1894 an appropriation was made of $300,000 available within the next fiscal year, and it is expected that all of this sum will be expended before July 1, 1895.

The commissioners are required to collect statistics and prepare maps of the highways in the state, and to collect such other material as may be useful in carrying out the project of state aid in building roads; that is, knowledge concerning geological formation, municipal boundaries, etc. The commissioners are required also to hold at least one public meeting a year in each county, for the open discussion of questions relating to the public roads. Local officers, such as county commissioners, mayors and aldermen of cities or selectmen of towns, may, when they think the public necessity and convenience require it, by petition, request the commission to take charge of a new or existing road in whole or in part. Then, if the commission thinks that the public uses will be served, it may lay out or take charge of such road and build it or repair it at the expense of the commonweath, and this shall be known as a state road and maintained thereafter by the state under the supervision of the commission. All encroachments upon the road in the way of openings or structures must be by permission of the commission, and property damages sustained by holders in consequence of the building of the road must be determined by the commission; and in case the commission and the owner of the property do not agree, a local jury must decide between them. A city or a town has the right to contract with the commission, without advertisement, for the construction of any such road within the limits of that corporation, but if the city or town does not elect to enter into such a contract, the commission must let the contract by public advertisement as is usual. Furthermore, the commission may contract with cities, towns or individuals for the maintenance of the state roads.

One quarter of any money expended under the provisions of the act in any county, with interest at the rate of 3 per cent., is to be repaid by the county to the state within six years. The treasurer of the state may, with the approval of the Governor and Council, issue 4 per cent. scrip to secure the money called for under the act, this scrip to run for a term not exceeding thirty years, and to be known as the state highway loan. The cities and towns have police jurisdiction over all state highways, but no encroachments upon these highways, of any sort, may be made without the written consent of the superintendent of streets or road commissioners of the city or town, approved by the highway commission.

It is the purpose of the commission, as we have said above, to expend the $300,000 already voted within the current fiscal year; but the commission has very judiciously decided not to attempt to organize or begin any great system of state highways. It will work under the theory that the carrying routes, traversing the state in its length and breadth, are already provided by railroads, and that the function of wagon roads is as auxiliaries and branches to the existing railroads. Therefore, the commission will be governed in laying out the new roads by two classes of considerations.

One is educational, and the aim will be to distribute these roads in short pieces all over the state, so that all communities may have the opportunity to see what constitutes a good modern road and what the costs and advantages of such roads are. Moreover, as towns and cities will often take contracts for building and maintaining the roads, the taxpayers will have an unusual incentive to become familiar with the work. This will be especially true when they come to maintain the roads that they have built, and keep them up to the strict requirements of the commission. It is proposed to make these state roads, as a rule, sixteen feet wide and to macadamize them, the thickness of the metal depending upon local conditions and upon the material most available; and it must be that a great many Massachusetts farmers will have a chance to become familiar with better roads than they have ever seen before in their lives. Another incidental advantage of the plan of town contracts will be, it is expected, that the work will be largely done by the people themselves, and that the communities will be spared the importation of gangs of Italians, Huns and Poles, which usually leave behind them stragglers who settle in the towns through which they pass and who are most objectionable citizens. It is believed that as a result of carrying on the work in this way the people in the state will get an education in road building and in the results of good roads that will lead to a great development of their highways.

The other set of considerations in locating the roads will be the needs of towns not very remote from each other for intercommunication, and especially for communication with railroad stations. We have sometimes discussed the advantages both to the communities and to the railroads, of good roads leading to the railroad stations. To the railroads themselves, such roads are scarcely less important than to the neighborhoods served. It is not merely that the total volume of produce will be increased by better means of communication, but the periods in which it is hauled to the stations will be lengthened, and so the business going over the railroads will be better distributed, as to time. A given number of tons of freight will be delivered at the stations within a period of two months instead of within a period of two weeks, for the farmers will not be obliged to take advantage of the hard roads to do their hauling. Of course, the advantage of such a change in practice is obvious, but, perhaps, it would be less important in Massachusetts than in many of the western states, for the people of New England are seldom afflicted with such bad roads as are common at various seasons in the deep prairie soils. Moreover, it is not likely that any important change in the time of shipping produce would come at once from the building of a few miles of road; but it is very probable that such a change as we have suggested would be the final result of extensive systems of roads through the farming regions that could be relied upon to be good in all weathers.

Naturally, this Massachusetts project met at once the opposition of those who are jealous in maintaining the principle that individuals and small groups of individuals should help themselves, rather than look to the state for help, and the project is open to the objection that it is a step toward assumption by the state of the responsibilities that ought to lie upon the local bodies; but it will be observed that the act is so framed that the initiative always comes from the town or county. That is, the local body must ask the state to undertake to build a new road or to repair and maintain an old one. Moreover, it is the expectation of those who have been especially interested in giving direction to this work that after a few years the state can abandon it entirely to the towns and counties.

There is one advantage from the participation of the state in the work which seems important; that is, as it is done under one bureau there will be an opportunity to collect and compare facts, such as could hardly be possible by any other system. The commission will be able to make close and accurate examination of the results got from different material under various conditions and it will very likely add something important to the present knowledge of the art of road building. Fortunately, the Dean of the Lawrence Scientific School is one of the commissioners, and under his direction careful experiments are being made in various ways. One of these is to ascertain the nature of the binding of the particles of road metal and the actual strength developed in the cementation, or whatever process it is, that takes place. In carrying out this experiment, careful tests will be made of the actual breaking strength of specimens of road metal of various material and sizes, compacted under heavy pressure, to imitate as nearly as possible the results got from rolling the material in place. This is one of several investigations that will be made, from the sum of which we may expect a good deal of useful knowledge.

The Chicago & Northwestern Report.

The report of the Chicago & Northwestern for the year ending May 31, 1894, is just out, and has some points of special interest. Naturally we look first to see the effect on such a stable property of a very bad business year, and to see the effect of the World's Fair on one of the great Chicago roads. The following table gives a convenient comparison of mileage worked and earnings from the classes of traffic:

	1894.	1893.	Dec. or Inc Per cent.
Average miles	4,841.35	4,273.07	
Passenger	$9,226,467	$7,956,440	I. 16
Freight	21,284,929	23,377,715	D. 9
Express	472,154	419,037	I. 13
Mail	714,095	663,776	I. 8
Miscellaneous	288.538	292,780	
Total	$31,986,182	$32,709,747	D. 2.2

The increase in mileage was from the absorption of the Milwaukee, Lake Shore & Western, 757.7 miles, operated nine months, and equated to 12 months in this table. The operating expenses decreased more than the gross earnings, viz., 6.7 per cent., to $19,867.628, or 62.11 per cent. of the earnings. After paying fixed charges and taxes the net revenue was $4,307,544, being $472,166 less than in 1893. Out of this dividends to the amount of $3,906,594 were paid, or 6 per cent. on the common stock and 7 on the preferred.

It will be observed that the passenger earnings increased 16 per cent. while the freight earnings fell off 9 per cent., and yet the whole number of passengers carried was slightly less than in the year before—that is, 17,082,400 were carried in 1894 against 17,191,075 in 1893. The average fare also declined, it having been 1.95 cents per mile in 1894 and 2.08 in 1893; but the passenger miles increased 23.87 per cent. up to 474,140,833. That is, the average journey was much longer in the last year—namely, 27.76 miles, as compared with 22.27 miles, an increase of almost 25 per cent. in the length of journey; and the average fare collected from each passenger was 54 cents against 46 cents the year before. This great movement of long distance travelers is of course accounted for by the traffic to and from the World's Fair. The earnings from first-class passengers—that is, the ordinary one way tickte—were actually $1,400 less than in the preceding year, having amounted to $5,347,000. But from round trip and excursion passengers the earnings were $2,617,148, an increase of $1,180,825, and from commutation travel the earnings were $1,196,335, an increase of $77,550. Obviously, a great many people took quarters in the suburbs for the Summer, or a part of the Summer. The round trip and excursion travel, as expressed in passenger miles, increased 106.33 per cent., while the ordinary first-class passenger miles increased but 3.9 per cent. and the commutation travel 7.02 per cent. The passenger train mileage inceased 15.19 per cent. The average number of miles run by each train was nearly 3 per cent. farther than the year before, and the average number of passengers carried was 7.54 per cent. more. It seems remarkable that the increase of one way travel should have been so slight, but it will be remembered that the passenger movement was extremely disappointing until the excursion rates were put in force.

The diminution in freight earnings extended though all classes, but it was greatest in the low class freight, such as iron ore and lumber, and consequently the average rate per ton per mile actually increased—namely, from $1.02 to 1.07 and the rate received for each ton was $1.64 as compared with $1.45 in the preceding year. The tone carried were 16,123,679 in 1893 and 12,949,382 in 1894, being a decrease of nearly 20 per cent., and the ton mileage fell off 13.16 per cent.

The economies of the year which enabled the company to work an increased mileage with a decreased total of operating expenses appear in most of the important items of working expense, although there was a great increase, over 50 per cent. in fact, in expenditures for renewal of ties. In repairs of roadway and track there was a saving of over $378,000, and in repairs of bridges and culverts over $121,000. In repairs of cars and locomotives, freight and passenger, the saving amounted to $735,000.

The President refrains from any comment as to the present situation or speculation as to the future.

Most of the readers of the *Railroad Gazette* who are interested in the handling of trains are familiar with Annett's key, and its use to fasten switches on English railroads, as described in various accounts of block signaling in that country. By its use a freight conductor, desiring to drop or take cars at a sidetrack remote from a signal cabin, must get the key from the signal man at the cabin, and after using it must return it to the same cabin, or the one next adjoining, before another train can be allowed to enter the same block section. The key cannot be withdrawn from the lock on the switch except when the switch is set for the main track. But it does not take long for even an ordinary genius to discover several loopholes in this arrangement for the maintenance of safety, and it is not surprising that improvements on Annett's arrangement have been proposed. The latest inventor in this line is Mr. Louis Dedel, of New Orleans. He has probably noticed—what is a familiar sight on some Southern roads—that a brakeman, after setting a switch for the sidetrack, will retire to the nearest rail fence and sit down and enjoy a smoke while his train is backing in. Even where they use a weighted lever, which, according to the theory, must be continuously held up by main strength in order to keep the switch set for the sidetrack, the ease-loving brakeman is still equal to the occasion if he can find a stout stick of suitable length to support the switch lever. But Mr. Dedel checks this kind of trickery in a manner too cute for anything. He takes Annett's key—or, rather, we should call it Dedel's key—and attaches it to a belt, and this belt must be fastened around the brakeman's waist. The remaining stage of the proceeding the reader can easily guess. The belt is locked by a key which is retained by the signalman in the tower. We have not been favored with a copy of Mr. Dedel's patent, but we assume that the length of the chain connecting the key to the belt is adjusted according to the moral character of the brakeman. A shaky rascal like those brakemen who struck in Chicago would, of course, be allowed only about 12 or 15 inches of chain. The only way to make such a fellow attend to business is to compel him to toe the mark without intermission. A reasonable brakeman—one who always goes back with the flag at least 50 feet, and who goes 50 or 100 yards when the superintendent is on the train—would be allowed enough chain so that he could sit down on the farther bank of the ditch; while a really trustworthy man, whose character was known from long expeience, could, we should say, be reasonably allowed any length of chain he might be willing to pay for. Then while waiting he could take up his position wherever he could find the most convenient seat. The best of brakemen will, however, sometimes impose upon the innocent farmer, and not even the longest chain should allow such leeway as to encourage orchard robbing. A brakeman who will climb pumpkin trees with mischievous intent deserves only rope enough

to hang himself with. Seriously, however, the trouble with these refinements of caution is that they simply shift the difficulty from one point to another without helping much toward removing it. A brakeman who is so anxious to evade his duty as to need to be chained to the switch would be smart enough to bribe the signalman to lend him the key, or even to make a duplicate key. The true function of a key like Annett's is to *aid* good discipline, not to take the place of it.

The reconstitution of the Panama Canal Company, which, in the trials at Paris a year and a half ago, was shown to have been the cover for so much amazing rascality, is apparently not prospering as favorably as those engaged in the effort to rescue some part of the immense sums sunk by the company in *not* building the canal, would have had appear a month ago. Then it was positively announced that a new company, under the title of the New Company of the Panama Canal, had been organized at Paris and subscriptions secured to the amount of twelve million francs, which, if admittedly not enough to complete the work, would under proper management make a good start; M. Gautron, the liquidator of the old company, had sanctioned the transfer of the uncompleted works, existing concessions and all its property, including the Panama Railroad shares, to the new company; the Government of Colombia had promulgated a new concession granting certain modifications, chiefly in the extension of time for doing the work, providing that actual work was resumed by October 21 next. Now a brief cable despatch from Panama announces that further modifications have been asked, and have been granted by Colombia. The despatch, while not giving particulars, doubtless means that subscriptions to the new shares have not been reliable enough to enable the company to meet the requirement to begin work in October, and probably the directors have not felt warranted in committing their company to the payment of the large sums demanded by the Colombian Government.

The Chicago, Burlington & Quincy recently did a notable day's work in moving freight between Galesburg and Chicago. During 24 hours, including the night of July 29 and the morning of the 30th, 1,164 loaded cars were sent east from Galesburg on 34 trains, averaging 34 cars each. Of this number 873 cars were loaded with livestock, which exceeds any former day's run of stock by about 200 cars. The 1,164 cars, including all kinds of freight, exceeded any previous day's run eastbound by about 300 cars. The time from Galesburg to Chicago, 163 miles, was made by all but five of the 34 trains in less than seven hours, or at a rate exceeding 23 miles an hour. All of the five, with one exception, made the run in less than eight hours; one train consuming a little over nine hours on a count of hot boxes. It was not a stock train. Mr. F. C. Rice, Superintendent of Illinois lines on this road, informs us that the ability of the company to make a record of this kind is due to a good track, good locomotives, the block system, and an exceptionally superior set of enginemen and trainmen, who are too intelligent and patriotic to have become associated with the American Railway Union.

NEW PUBLICATIONS.

Transactions of the Society of Naval Architects and Marine Engineers. Vol. 1, 1893. Edited by the Secretary, 12 West 31st street, New York City.

The first general meeting of the new and important society known as the Society of Naval Architects and Marine Engineers was held at the house of the American Society of Mechanical Engineers last November. We gave at the time a review of the papers read and the discussions. The list included 14 papers, most of them important, and two or three of them of quite unusual importance. These are now collected in a handsome volume of 262 pages, besides numerous lithographed plates. We do not know whether or not the volume is for sale, but assume that it is, and that the most direct way of addressing the Secretary would be 1710 F street, N. W., Washington, D. C.

Pocket Primer of Air Brake Instruction is the title of a small pamphlet just issued by Mr. W. S. Rogers, M. E. air brake instructor on the Delaware & Hudson In the introduction the writer says that the book does not give an explanation of every ill connected with the air brake, because the automatic air brake has no ailments, "provided we always do one thing and understand three things concerning it." Mr. Rogers devotes his energies then to explain that the one thing to do is to keep the air brake clean and in order; and that the three things to understand are: first, its fundamental principle; second, values and actions of compressed air; third, the importance of time required for different actions.

The pamphlet is arranged in seven lessons, each of which is preceded by a "key chart" in which questions are asked, the answers to which will be understood or reasoned from the contents of the lesson. Each lesson is devoted to some particular part or function of the air brake, and in the former case an illustration of the part is given at the beginning of the lesson. The lessons are devoted, in order, to: compressed air, triple valve, car essentials, train preparation, engineer's brake valve, engine equipment and driver brakes There are instructions to engineers, engine-house foremen, trainmen and inspectors, and rules for testing brakes, air-signal and retaining valves; and the Master Car Builders', rules governing air brake interchange.

In the lesson devoted to the engineer's brake valve is given an illustration of a hydrant, and vessels of various capacities, corresponding to the volumes and pressures in the different air reservoirs and stop cocks, operated by floats; by means of this illustration the principle used in controlling air in the main reservoir, train and whistle lines is made clear.

The pamphlet is entitled a "pocket primer," but it is of too high an order to be so termed. It is rather above the understanding of the average train or engine man, and will be more thoroughly appreciated by air brake instructors and higher officials, and should be valuable to them as a guide in issuing instructions concerning the handling of the air brake.

TRADE CATALOGUES.

The Star Brass Manufacturing Co., of Boston, has issued its 1894 catalogue of steam gages, safety valves, whistles and a hundred other steam users' appliances. Like many other catalogues now issued this work has valuable chapters of "useful information" for engineers and others, which seem to have been compiled with great care. There is a cipher code for sending orders, in which there is an example showing a message of 38 words reduced to 8 words.

The Tanite Co., Stroudsburg, Pa., has issued a new catalogue of its emery wheels for 1894. This is a very complete catalogue and seems to give all information about the product of the company that any one could desire. The editor of the Tanite Co., has the faculty of conveying ideas in a very clear manner and without waste of words. The catalogue includes a number of brief discussions of principles which are of interest to users of emery wheels, and it has a good index. In addition to all these good qualities the book is small in size so that it can be conveniently carried in the pocket.

TECHNICAL.

Manufacturing and Business.

The Edward P. Allis Co., of Milwaukee, has given a mortgage on its plant for $340,000 to the Northwestern Mutual Life Insurance Co.

Mr. John F. Donohue, of Boston, said to represent several capitalists who intend to build a car shop near Wilmington, Del., says that his company is organized under the laws of the latter State with a capital of $2,500,000.

The Falls Hollow Staybolt Co., of Cuyahoga Falls, O., has been able to keep its works running steadily on orders for safety hollow bolt iron without interruption. The company is prepared to fill all orders to any amount promptly.

The Berlin Iron Bridge Co.'s recent orders for machine shop work, include a large addition to the Worthington Hydraulic Works at Brooklyn, N. Y., and for a gas house roof for the New Jersey Gas & Construction Co., of South Amboy, N. J.

The Union Switch & Signal Co. has entered suit in the courts of Pennsylvania against the National Switch & Signal Co. for infringement of various signal patents, including those originally taken out by Albert G. Cummings, Henry F. Fox, J. T. Hambay and C. H. Jackson.

The Harlan & Hollingsworth Co., of Wilmington, Del., has received a contract to build a four-deck steamship for the Merchants' and Miners' Transportation Co., of Baltimore, Md. The new vessel will be 270 ft. long, 67 ft. beam and 34 ft. deep, and will run between Baltimore and Boston.

A charter has been granted to the Longmead Iron Co., of Conshohocken, Pa. The incorporators are: Jawood Lukens, Conshohocken; James E. Salter, Philadelphia; Albert L. Murphy, Conshohocken; Lewis M. Lukens, Elizabeth, N. J.; Thomas C. Yocum and Henry M. Tracy, Conshohocken.

The Canadian Government will receive bids until August 31 for a spoon dipper dredge, with steel hull, steel boom and compound surface condensing engine, for salt water service. Specifications can be seen at the engineers' offices at St. Johns, Halifax and Quebec; at Montreal and Toronto, and at the Department of Public Works.

The Detroit Graphite Mfg. Co. reports an increasing demand for its different brands of paint. The company is now making six brands; No. 30, a dark slate color, its natural color, for roofs, bridges and all other places where another color is not more desirable; No. 32, a railroad brown; No. 34, marine black; No. 35, bridge red; No. 36, a specially prepared paint for application to surfaces that are subjected to intense heat, and No. 38, a dark green, for store fronts, fences and similar places. Excepting No. 36, the above are different only in color.

John Wood, Jr., of the Schuykill Foundry & Machine Works, Conshohocken, has just received the following orders for his water tube boilers: 500 h.-p. for the E. & G. Brooke Iron Co., Birdsboro, Pa.; 500 h.-p. for the Ellis & Lessig Steel & Iron Co., Pottstown, Pa.; 500 h.-p. for the J. Wood & Bros. Steel & Iron Works, Conshohocken, Pa.; 400 h.-p. for the Belvidere Light Co., Belvidere, N. J.; 500 h.-p. for the Jenkintown Light Co., Jenkintown, Pa. Mr. Wood says his Western works at Zanesville, O.; Saginaw, Mich., and St. Louis, Mo., are full of orders.

Manning, Maxwell & Moore, the selling agents for the Shaw Electric Crane Co., of Muskegon, Mich., report a number of orders for the Shaw three-motor electric traveling cranes made by that firm. The Midvale Steel Co. of Nicetown, Philadelphia, which has already in its works one 80-ton, two 40-ton and two 20-ton Shaw electric cranes is having built an additional 40-ton double trolley crane. A 30-ton crane has been ordered by the firm of Henry R. Worthington for its Brooklyn pump works to supplement a Morgan electric crane. Another order is for a 12-ton crane for the Pittsburg Tin Plate works.

The Boston & Lockport Block Co. has been chartered in New York to take over the property of the New Jersey corporation which was purchased at receivers' sale by Ambrose S. Beverly, of Lockport, N. Y., who has assigned his purchase to the reorganized company. The new company has a paid up capital stock of $200,000 and secures possession of all the real estate, machinery, patents and other property of the old company. The two large factories at Boston, Mass. and Lockport, N. Y., will continue to be operated. A. S. Beverly is President of the new company, Albert D. Bosson is Vice-President and Myron H. Tarbox is Secretary and Treasurer.

Queen & Co., incorporated, the well-known Philadelphia manufacturers of engineers' and mathematical instruments, made an assignment on August 7 without preference to Mr. John G. Gray, the manager of the firm. This step was forced by the difficulty in making collections through the long business depression. The immediate cause was a pressing obligation which had to be met. The business of Queen & Co. was established in 1853 under the name of James W. Queen & Co., and it was developed until the firm became the most prominent house in its line. Last year the firm was incorporated under the title of Queen & Co., with a paid up capital stock of $600,000. A meeting of the creditors was held in the Drexel Building, Philadelphia, on August 13, to consider the best method of disposing of the assets of the company.

Iron and Steel.

After being idle since April 18, operations have been resumed at the Sharon Iron Works.

The Edgar Thomson Steel Works have started up again in full in every department. The prospects are bright for a good season's work.

Iron and steel operations have been resumed at the Mahoning Rolling Mill, and the Montour Steel & Iron Works, of Danville, Pa.

The Phœnix Iron Co., of Phœnixville, Pa., has shipped 15 carloads of finished bridge iron to Cuba. This iron is to be used in constructing bridges on a railroad line.

The North Branch Steel Works, of Danville, Pa., are working on an order for 77½-lb. steel street rails for a road in Vancouver, B. C. Contracts have also been made with Chicago and St. Louis parties.

Three of the plants belonging to the American Steel Co. are in operation—the Standard, Thurlow; the Solid at Alliance, and the Pittsburg—and three are idle. The outlook for an early resumption of work at the idle shops is not encouraging.

Another department at the Boston Iron & Steel Works, at McKeesport, has resumed operations; also another department of the National Tube Mill. The Monongahela Steel Works are now running, and nearly all the mills are operating to their full capacity.

New Stations and Shops.

The foundations for the new shops of the Buffalo & Susquehanna, at Galeton, Pa., are nearly completed, and it is expected that work will be commenced this week on the iron and brick work. The shops will include a paint shop, a round house containing 17 stalls, machine shops, car shops, planing mill and an office. There will also be a 60-ft. turn-table.

The Internal Navigation Congress.

The sixth International Congress on Internal Navigation opened at The Hague, Holland, July 23. From the official bulletins received it appears that the delegates, their wives, sweethearts and other friends have had what might be called "a good time." There have been concerts, receptions and exursions planned and apparently very largely attended. For instance, the excursion to the Hook of Holland was attended by more than 400 persons, many of them ladies. Altogether about 500 delegates or members of the Congress were present in the first week. The first section considered matters of construction and maintenance of canals and navigable waterways. The second section in the first week was largely occupied with obstructions from ice, the third with the question of tolls, and the fourth with tidal waterways. The excursion to the Hook of Holland included a visit to Rotterdam, where the party was received with great attention. The day before a paper on the Port of Rotterdam, by Mr. De Jongh, Director of Public Works, and one on the new waterway from the Hook of Harlem to Rotterdam, by Mr. W. G. Triest, of New York, were read. These prepared the party for what they had to see. It has been decided to hold the next meeting of the congress in Italy in 1896.

Smoke Prevention in Chicago.

Considerable attention is now being given to the subject of smoke prevention by users of coal in and near Chicago. Instructions have been given to the city smoke inspector and to the legal department to prosecute the numerous offenders against the smoke ordinance, and information has accordingly been filed against quite a number. Two hundred and six suits have been prepared for prosecution, of which number 116 are against railroads, 50 against owners of buidings and 40 against tugboat owners. Experi-

ments are being made on some of the tugboats with hard coal screenings treated with a chemical compound, the composition of which is said to be a secret, and for which extravagant claims are made. As a good example to others the city Board of Education is preparing to equip the larger school buildings for using natural gas, which has been offered at the same price per year that has been paid for bituminous coal. It is proposed to furnish hard coal to the buildings not included in the proposition of the gas company.

The Mullan Tunnel.

A portion of the roof of the Mullan tunnel, Northern Pacific Railroad, caved in on the night of August 12. A number of workmen who were engaged in lining the tunnel had a narrow escape, having left the tunnel but a few moments before to allow a train to pass.

Car Heating.

For some time past the Baltimore & Ohio Railroad Co. has been investigating the different systems of steam heating, and the result of their investigations has been the adoption of the Gold Car Heating Co.'s system for the equipment of all its passenger cars. This order not only includes the Gold system of steam heating, but also the Gold steam coupling with automatic gravity relief traps. This order covers the entire passenger equipment for the main line of 548 cars, and is one of the largest contracts as ever given to a steam heating company. The Gold Car Heating Co.'s system has also been adopted on the Annapolis Short Line and on the Western Maryla d.

Some time ago the legislature of Maryland passed a law requiring all railroads to equip their passenger cars with steam.

THE SCRAP HEAP.

Notes.

The shops of the Wagner Palace Car Co., at East Buffalo, are to be shut down on August 18, there being no work on hand.

At Petersburg, Va., on August 13, it was reported that the section men of the Atlantic & Danville had struck because their pay was reduced from 75 cents a day to 67½ cents.

A postal car is now running on the Atlantic Avenue Electric Railroad in Brooklyn, N.Y., making regular trips between the main post-office and Bensonhurst, Gravesend and other suburban districts.

The important improvements connected with the abolition of grade crossings in Brockton, Mass., described in the *Railroad Gazette* of April 13, were begun last week. It is said that the total cost will be about $1,500,000.

The trains of the Fitchburg Railroad began running to and from the new Union station in Boston on August 12. It is claimed that now there are more trains arriving and leaving this station daily than at any other in the United States.

Two bridges of the Chicago & Eastern Illinois near Brazil, Ind., were burned on Aug. 7, and the mob of strikers that has been committing outrages in and around that city is suspected of the crime. Four strikers were arrested for assault at Brazil, Aug. 10.

Traffic was resumed on Aug. 13, on the South Fork, Unity, Hempfield and Sewickley branches of the Pennsylvania in Western Pennsylvania, after a suspension since May 10. These branches are operated chiefly for the coal traffic, and business was suspended on account of the coal strike.

On the Lehigh Valley, 12 passenger train crews now run through between Easton, Pa., and Buffalo, 371 miles. The Cleveland, Cincinnati, Chicago & St. Louis will make a similar arrangement on Sept. 1, with four through trains each way daily between Cleveland and Cincinnati. The length of this run is 263 miles.

The officers of the Pennsylvania lines in Ohio were engaged last week in taking the County Auditors over the lines of the road to inspect the property previous to its valuation for taxation. A local paper says that the trip will be extended to Cresson, Pa.; but whether anything is to be assessed at that point is not stated.

President Cleveland has approved the law recently passed requiring railroads to establish stations in the territories wherever town sites are ordered by the Interior Department. This law will settle the controversy in Oklahoma where the contests between certain towns and the Chicago, Rock Island & Pacific have resulted in bloodshed.

The final papers of acceptance of the track elevation ordinance of the Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific railway companies were filed with the Chicago city authorities last week, and a cash payment of $100,000 made to the city. The work of elevation is to begin between Sixteenth and Twenty-fourth streets, and it is proposed to finish this section within a year.

The arrangements for beginning work on the subway for the tracks of the Philadelphia & Reading Railroad in Pennsylvania avenue, Philadelphia, are now practically completed; but it will first be necessary for the city to make a large new sewer, 30 ft. underground, in Callowhill street to take the place of one to be destroyed when the new work is begun. This will be a considerable undertaking, costing about $500,000.

A passenger train of the Missouri, Kansas & Texas was fired into by robbers near Bond, I. T., on the night of Aug. 5. At Kessler, Ind., on the night of Aug. 6 a passenger train of the Lake Shore was side tracked by train robbers who fired at the engineman, but the latter suspected robbers and ran through the side track and out at the other end without stopping, breaking through a heap of stones, that had been piled in his way, without running off the track.

Coxeyites have made trouble at a number of points lately, and the police of Washington, D. C, have had to deal with large numbers of them. At Alexandria, Va., so many of them congregated that the Governor of the State ordered out the militia and drove the tramps across the Potomac river. The authorities of the District of Columbia paid railroad fare to the Mississippi river for about 100 who claimed that they wanted to go to California. A band of 30 took possession of a freight train at May's Landing, N. J., Aug. 7. Similar outrages are reported from New Brunswick, N. J., Cranford, N. J., and Lafayette, Ind. Conductors have caused the arrest of large numbers along the line of the Pennsylvania Railroad, and there is said to be a noticeable decrease in the number haunting that railroad.

The Attorney General of Illinois has filed a petition in the County Court at Chicago to annul the charter of the Pullman Palace Car Co., on the ground that it has exceeded its privileges by operating theatres, hotels, gas works, dwelling houses and other enterprises not authorized by the charter.

The Pullman Company has given the newspapers a long statement outlining the defense it will make to the suit. A sketch of the history of the establishment of the town at Pullman is given with a statement of the motives for establishing it. The shops were located in what was then a wilderness, and it was necessary to build dwelling houses. For the moral and physical welfare of the men and their families special pains were taken to provide the best architectural and sanitary conditions, and to exclude liquor shops and all such offensive features. Speaking of the Pullman Building in Chicago, the larger part of which is rented to outsiders, it is explained how numberless other corporations pursue the same course, and it is stated that the company is willing to abide by the decision of the highest court of Illinois.

Lake Notes.

Nineteen lumber cargoes aggregating 15 million feet, were being loaded at Duluth in one day last week, and the shipments from that port for the season have been about 75 million feet.

Some remarkable work has been done at lake receiving ports by new loading apparatus. The steamship Manola was emptied of 2,336 tons ore, and loaded with 1,421 tons coal in a single day. Three hundred and sixty tons were loaded in one hour.

Because of high water in the Sault canal, and the increasing size of the lake vessels, the cargo records are being frequently broken. The steel ship Curry took to the head of Lake Superior 3,700 tons coal, and took away 3,850 tons ore last week. The steamer Mohican took away 1,148,000 feet of lumber.

The Minnesota Steamship Co., of Cleveland, has contracted with the Chicago Shipbuilding Co., for two steel tow barges, to be duplicates, 302 ft. long, 40 ft. beam and 24 ft. deep, and equipped with three masts and sails and stay sail forward. They will be steered by steam and steam towing machines will be furnished. The new boats will be the first barges on the lakes to be lighted with electricity. They are to be ready for business at the opening of navigation next year.

The Great Northern Railway, which owns the grain elevators bearing its name at the head of Lake Superior, has made a sensation in northwestern grain and shipping circles by announcing that it will reduce grain storage charges about 50 per cent. There are 27 million bushels elevator capacity at Duluth and Superior, built at a cost of about $4,000,000, and this reduction will seriously affect the annual profits of these elevators. Elevators at Minneapolis, where there is some 25 million bushels capacity, will be compelled to make a similar reduction, while those at Chicago and Milwaukee will be affected.

The statement of the St. Mary's Falls canal for the last year has been issued. It shows that the total tonnage through the canal in July was 1,637,618 tons, against 2,017,000 tons in the same month last year. But July, 1893, was the largest month ever known in the history of the canal. The business of this season has been, to date, 5,096,033 tons, while in the same time last year it had been only 17,000 tons more. The greatest increase has been in ore, 3,077,000 tons passing in this season to date, while 1,928,000 tons was the business of the last year to this time. The enormous quantity of 326 million feet of lumber has passed up to date, an increase over last year of 77 million. Flour carried has increased 607,000 bbls., to 3,360,000 bbls., while wheat has fallen off from over 21 million bushels to a trifle less than half that total. Coal traffic has fallen off 60 per cent., to 533,000 tons, on account of the strikes in the east. Passengers carried have increased from 8,807 for August of last season, to 12,676 this year, this being largely owing, of course, to the additional facilities afforded by the new steamship "Northwest."

Chicago Elevated Railroads.

An attachment suit for $22,500 has been commenced in Chicago against Underwood & Green, the builders of the Lake Street Elevated Railroad, and heavy stockholders in that corporation. H. R. Holland, the plaintiff, was one of the original stockholders of the road, and claims to hold contracts for the delivery of stock, and also to have loaned money to the defendants. The suit is brought to recover the amount claimed rather than to get possession of the stock. Similar proceedings have been brought against the same firm by Morris H. Alberger for $33,000, on a contract account for labor.

Disastrous Train Wreck at Lincoln, Neb.

Passenger train No. 8 of the Chicago, Rock, Island & Pacific was derailed on a trestle about four miles from Lincoln, Neb., on the night of Aug. 9, and the engine and two cars fell about 30 ft. to the bed of the creek below. The trestle was very dry, and it took fire from the coals in the engine, and the whole wreck was set afire; and in five minutes it was a mass of flames. The passenger cars lodged on top of the cars which first fell, and most of the occupants of the train were pinned in the wreck. Fourteen passengers in the hind car were rescued, most of them but slightly injured, but everyone else on the train, except two or three, was badly hurt by the fall or killed by the fire, and the total number of fatal injuries at last accounts was reported as 24. Eleven bodies only had been identified. It is said that the rails had been maliciously loosened, and that the claw bar and wrench used in loosening them were found near by. Twenty-four bents of the bridge were burned, leaving 13 standing. The track of the Union Pacific passed under the bridge and was obstructed by the wreck.

George Davis, a colored man, suspected of wrecking the train, was arrested by the police the next day. Shortly after the wreck he applied to a hackman and asked to be driven up town; he had been on the train and had lost his coat.

Photographing Bridge Vibrations.

The application of photography to the determination of bridge vibrations and deflections under various loads is at present being studied by the French Department of Public Works, and is thought likely to prove of practical use—at least so says the *Revue Industrielle.*

Express Trains on the Brooklyn Elevated.

The Brooklyn Elevated road commenced running express trains last Monday morning on its Broadway line, between the Broadway ferries (Williamsburg) and Myrtle avenue (a transfer station for trains to either Fulton Ferry or Ridgewood), a distance of about two miles. From hat station to Cypress Hills Cemetery, the terminus of the main line, three miles distant, the trains become local. The Brooklyn, Queens County & Suburban Electric road, which runs directly under the elevated along its entire length on Broadway, was recently opened for traffic. This fact probably influenced the elevated road officials in their decision to introduce express trains. Successful competition with the trolley necessitated a reduction in the time of the elevated trains running to the Broadway ferries, which daily carry many passengers to Roosevelt and Twenty-third streets, New York. Commencing August 19 trains heretofore running between Ridgewood and Fulton Ferry via. Myrtle and Hudson avenues and York street, will follow the main line via City Hall to the bridge terminal station. Shuttle trains will run between the station at Navy street and Myrtle avenue and Fulton Ferry. With the present bridge terminal facilities this change will tend to cause delays during rush hours between the City Hall station and the bridge.

CAR BUILDING.

The Harlan & Hollingsworth Co., of Wilmington, Del., has completed two cars for the United States Fish Commission.

The Illinois Central Railroad Co, is asking for bids on some 50,000-pounds capacity fruit cars, and some 60,000-pounds capacity stock, coal, box, furniture and refrigerator cars. The total number of cars required is 509, some of which are to fill old numbers.

BRIDGE BUILDING.

Albany, N. Y.—Gratton & Jennings, the well-known Buffalo contractors, are reported to have received the long deferred award for the construction of the pile bridge for the New York Central & Hudson River Railroad in the so-called upper basin at Albany. Early in May Governor Flower, of New York, approved a bill authorizing the railroad company to build a pile bridge across the Hudson River at Albany, with an opening of sufficient width to permit the passage of canal boats. The bids for work were to have been given out a month ago but Chief Engineer Katte has postponed the announcement of the award until the present time.

Berryville, Ark.—The King's River & Osage Bridge Co., has been incorporated to build highway bridges over King's River and Osage Creek between Berryville and Eureka Springs. Charles E. Davis is President, M. O. Hines, Treasurer and J. D. Jordan is Secretary.

Bloomsburg, Pa.—The County Commissioners have let to the King Iron Bridge Co., now erecting an iron bridge over the river at this point, the contract to build a 99-ft. span bridge in Mifflinville, and a 28-ft. span bridge over Raven Creek. The bids were as follows:

	99 ft.	28 ft.
Nelson & Buchannan, Chambersburg	$1,875	$435
Toledo (O.) Bridge Company	1,950	450
King Iron Bridge Company	1,810	390
Groton Bridge Company	1,890	460
Massillon (O.) Bridge Company	1,898	470

Louisville, Ky.—The Phœnix Bridge Comany, of Phœnixville, is making preparations to re-erect the bridge between Louisville and Jeffersonville, which fell while in the course of erection last December. A large portion of the iron work has been taken to Phœnixville, where it is being made over and sent back for use in the new work.

Luke, Md.—At a meeting of the commissioners of Allegany County, Md., and Mineral County, W. Va., held at Piedmont, on Aug. 9, the contract for the erection of a bridge over the Potomac at Luke, was awarded to the Youngstown Bridge Company, of Youngstown, O., for $7,301. The work is to be finished in three months.

Moore, Ga.—Grant Wilkins, of Atlanta, Ga., has been awarded a contract for building a steel viaduct over the Tiger river, near Moore, on the line of the Port Royal & Western Carolina Railroad. The viaduct will be 90 ft. high and 600 ft. long, and will cost about $18,000.

New Brunswick, N. J.—Secretary of War Lamont has decided that the Pennsylvania railroad is not violating any United States law in erecting a solid bridge across the Delaware & Raritan canal in this city. The decision was given in the matter of the protest of the city against the proposed substitution of a solid bridge in place of the draw, and is based on the ground that the canal cannot be considered as navigable water.

Philedelphia.—The plans for five bridges are now being completed by the Bureau of Surveys, and bids will be advertised for in about a month. Advertisements for those at Sixty-third street over the Baltimore Railroad, and Wayne avenue over the Chestnut Hill Railroad, have already been published. The other three bridges will be built at Seventeenth street, under the Connecting Railroad; Sixth street, over the Reading, and Thirty-third street over the Reading and Pennsylvania.

Red Wing, Minn.—Thirteen tenders were received for the construction of the steel superstructure of the wagon

bridge across the Mississippi River at this place. C. F. Loweth, C. E., of St. Paul, who prepared the plans for the bridge and will superintend its construction, was authorized to award the contract to the bidder whose bid is found to be lowest.

Richmond, Tex.—The Bridge and Building Department of the Southern Pacific has completed plans and specifications for the strengthening of the three-span bridge across the Brazos river at Richmond, and work will be commenced in a few days. A new iron span will be substituted for the middle wooden span now in use, the other two being iron. This will make it a solid iron structure.

South St. Paul, Minn.—The contract for the South St. Paul Belt Line Railway and Briage Co.'s bridge, connecting South St. Paul and St. Paul Park on opposite sides of the Mississipi River, has been awarded to the Pittsburgh Bridge Co. The contract for the substructure has been sublet to Charles Stone of St. Paul. C. F. Loweth, C. E., of St. Paul, will superintend the work.

Spokane, Wash.—The plans for the new Lapray bridge, between Spokane and Stevens counties, have been completed by Cunningham & Bayley, and will be submitted to the commissioners for approval. Bids for building the bridge will soon be called for. It will be a Howe truss, the total length of the structure being about 350 ft. The cost will be from $3,500 to $4,500, of which each county will pay one-half.

Toledo, O.—Bids will be received by L. P. Harris, City Clerk, until Sept. 10, for constructing a bridge over Swan Creek on St. Clair street. The bridge will consist of a stone substructure and an iron or steel superstructure, the bidders to furnish their own plans.

Williamsport, Md.—The Potomac Bridge Co., which was organized some weeks ago to build a bridge across the Potomac River at this point, has been reported to have decided upon the site for the structure, and to have its engineers now drawing up the plans. The officers are: J. H. Hoffman, president; J. L. Motter, treasurer, and M. E. Cullen, secretary.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Maine, $3 per share on the preferred stock, payable Sept. 1.

North Pennsylvania, quarterly, 2 per cent., payable August 25.

St. Paul & Duluth, 2½ per cent. on the preferred stock, payable Sept. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 22.

New York Susquehanna & Western, annual, Jersey City, N. J., Sept. 6.

Wabash, annual, St. Louis, Mo., Sept. 11.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its annual convention in New York city beginning Sept. 11 and lasting three days. The first meeting will be held in Tammany Hall and the following ones at the Broadway Central Hotel which will be the headquarters of the Association.

The Master Car & Locomotive Painters', Association will hold its annual convention at Buffalo, N. Y., on Sept. 12, 13, 14. The headquarters will be at the Genessee Hotel.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York city, on the third Thursday in each month, at 8 p m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

Contracting Freight Agents' Association.

The National Association of Contracting Freight Agents met at Niagara Falls, Aug. 13, about 100 delegates being present. Mr. Benton Johnson, of Chicago, was chosen President for the ensuing year, and Charles A. Egley, of Cincinnati, Secreatry and Treasurer.

PERSONAL.

—Mr. P. A. Rockwell, Assistant General Freight and Passenger Agent of the Eastern Railway of Minnesota, has resigned.

—Mr. William Wilson, Superintendent of Electric Signals of the Hartford Division of the New York, New Haven & Hartford, died at Cherryfield, Me., on Aug. 9, at the age of 31 years.

—Ex-Judge Joseph P. Wightman, one of the early settlers of Burlington, Iowa, and for a number of years a director of the Chicago, Burlington & Quincy Railroad, died at Chicago on Aug. 8.

—Mr. Luther Challis, who was at one time engaged in the West as a railroad builder, died at Atchison, Kan., on Aug. 12. He secured the charter for the Atchison & Pike's Peak Railroad, and was its first President.

—Mr. S. L. Rainey, Trainmaster of the Union Pacific, Denver & Gulf, at Denver, has been appointed Superintendent of the Denver, Leadville & Gunnison. The latter road is operated by the same receiver as the former, both having until recently been part of the Union Pacific.

—We regret to learn that Mr. E. L. Corthell is seriously, and perhaps dangerously ill in Europe, and we hope sincerely for his speedy restoration to health. Mr. Corthell is a man of rare qualities. He has energy, talent, rectitude and geniality in high degree, and we can't spare him yet.

—Mr. Daniel McLaren has been appointed general superintendent of the Montana Central Railroad. The Montana Central was formerly operated by a separate general superintendent, but latterly it has been included in the jurisdiction of the general superintendent of the Great Northern. Mr. McLaren was formerly general superintendent on the Mobile & Ohio Railroad. He resigned that position last March.

—Mr. Henry S. Priest, the general attorney of the Missouri Pacific Railroad, has been nominated to be United States District Court Judge. Mr. Priest will continue his connection with the railroad company at least until September. The general solicitor of the Missouri Pacific, Mr. Alexander G. Cochran, is now in Europe and will not return before next month and the appointment of Mr. Priest's successor is not likely to be made until he gets home.

—Mr. H. W. Gays has been appointed traffic manager of the St. Louis, Chicago & St. Paul railroad between St. Louis and Springfield, Ill., which is now being operated by Mr. I. W. Fowler as general superintendent for the Receivers. Mr. Gays was until recently general manager of the St. Louis Merchants' Bridge & Terminal Railway Co., retiring in April last when the operating agreement between that company and the Terminal Railroad Association, operating the Eads Bridge went into effect. Mr. Gays' work has been chiefly as a traffic officer and he has earned a high reputation in the West in that department of railroading. Before his connection with the Merchants' Bridge Co. he was general manager of the Wiggins Ferry Co., his service with that company beginning in 1885 and continuing until his appointment as general manager of the Merchants' Bridge. He was for some years general freight agent of the Indianapolis & St. Louis and assistant general freight agent of the controlling company, the Cincinnati, Indianapolis, St. Louis & Chicago. During the recent strike he acted as agent of the temporary St. Louis General Managers' Association.

—Mr. J. W. Reinhart, President of the Atchison, Topeka & Santa Fe, has resigned, and the directors, at a special meeting in New York, on Aug. 11, accepted the resignation. The letter of resignation had been made public the day before, but it was dated on Aug. 8, previous to the publication of the report of Mr. Stephen Little on the road's financial condition. Mr. Reinhart, on the same date, asked the United States Court having jurisdiction to relieve him of his duties as one of the Receivers of the property. The Atchison directors named Sept. 1 as the day when Mr. Reinhart's resignation should become effective, but it is believed that he will retire before that, if his successor as Receiver is appointed without a long delay. Mr. D. B. Robinson, First Vice-President of the Atchison, in charge of the operating department, has been elected Acting President pending the appointment of a President, which, however, is not likely to be made for some time. Mr. Reinhart has been in railroad service about 25 years, but has been generally known only since his connection with the Atchison, which began in 1888. When Mr. Reinhart was appointed General Auditor of the Atchison he was reckoned one of the ablest railroad accountants in this country, and he soon further distinguished himself by his remarkable work in straightening out and systematizing the accounts of the road, which had became exceedingly complicated through the acquisition of many small companies in the years just previous and the rapid extension of lines. The Atchison reorganization scheme of 1887, which created a consolidated mortgage to retire the mortgages on the subsidiary roads without a single foreclosure, was generally regarded as having been developed by Mr. Reinhart. In 1889 he was appointed Fourth Vice-President, and in 1890. First Vice-President. He was elected President in March, 1893, on the death of Mr. Allen Manuel.

ELECTIONS AND APPOINTMENTS.

Attica & Freedom.—G. W. Conklin, formerly Master Mechanic of the Bradford Division of the New York, Lake Erie & Western, is to be Superintendent of this railroad in New York State now being reconstructed by S. S. Bullis, of Olean, N. Y.

Canada Eastern.—The names of the officers of this road are as follows: Alex. Gibson, President and General Manager, Marysville, N. B.; Thos. Hoben, Superintendent and General Freight Agent; A. McN. Shaw; Auditor and General Passenger Agent; P. A. Logan, Mechanical Superintendent; John Mabee, Master Car Builder; E. Johnston, Track Master. The officers, all except the President, are at Gibson, N. B.

Chicago Milwaukee & St. Paul.—The following changes are announced on this road: W. J. Underwood, Superintendent of the River Division to be Assistant General Superintendent of the Middle Division, effectve Aug. 15. D. L. Bush is transferred from the Hastings and Dakota division to the River, Chippewa Valley and Wabasha divisions, succeeding Mr. Underwood. J. R. Williams is transferred from the Iowa and Minnesota to the Hastings and Dakota division. F. T. Fox (formerly Trainmaster) is appointed Superintendent of the Iowa and Minnesota division.

Chicago & Western Indiana.—J. M. Warner, formerly Master of Transportation, has been appointed Superintendent, the appointment taking effect August 10. The office of Master of Transportation is abolished.

Choctaw Coal & Railway Co.—J. F. Hinckley has been appointed Chief Engineer, with headquarters at South McAlester, Indian Territory.

Cleveland, Cincinnati, Chicago & St. Louis.—C. O. Stimson has been appointed Division Freight Agent at Lafayette, Ind., to succeed A. M. Stimson.

Denver, Leadville & Gunnison.—The following appointments are announced by Receiver Trumbull. T. F. Dunaway, General Superintendent; F. Wild, Jr., General Freight Agent; F. B. Semple, General Passenger Agent; A. D. Parker, Auditor; Charles Wheeler, Treasurer; Pattison, Edsall & Hobson, General Counsel; Dr. F. J. Bancroft, Chief Surgeon.

General Superintendent Dunaway has issued a circular announcing S. L. Rainey as Superintendent. Other officers are H. F. Parke, Superintendent of Telegraph and Car Service Agent; H. W. Cowan, Resident Engineer; J. D. Hollister, General Claim Agent; B. L. Olds, Purchasing Agent; A. Zimmerman, Superintendent of Bridges and Buildings. Most of these officers hold similar positions on the Union Pacific, Denver & Gulf. All have their offices at Denver, Col.

Pecos Valley.—A circular has been issued announcing the appointment of W. I. Church as General Freight and Passenger Agent, with headquarters at Eddy N. M., to succeed A. T. Cranfield, deceased. He will have charge of traffic and claims.

Rio Grande Western.—Jules La Barthe, formerly Superintendent of the Utah division of the Denver & Rio Grande Express Co., has been appointed Claim Agent of this road to succeed Frank Holtzheimer.

St. Louis, Chicago & St. Paul.—A circular has been issued announcing the appointment of H. W. Gays as Traffic Manager with headquarters at Alton, Ill.

St. Louis Merchants' Bridge Terminal.—A circular has been issued announcing the appointment of S. D. Webster as Freight Claim Agent, with office at St. Louis, Mo. He will have charge of the adjustment and settlement of all claims relating to freight traffic. Mr. Webster holds the same position with the Terminal Railroad Association.

South Jersey.—W. G. Christian, formerly Supervisor of the Lebanon Valley and East Penn branches of the Philadelphia & Reading has been appointed Superintendent of this road, with headquarters at Cape May, N. J.

Southern Pacific.—L. J. Parks has been appointed Assistant General Passenger and Baggage Agent of the Atlantic system, the appointment taking effect August 15.

Washington County.—The following are the directors of this company, organized at Machias, Me., last week under the charter granted by the last legislature: George A. Curran, George A. Murchie, N. B. Nutt, G. R. Campbell and A. F. Kingsley. George A. Curran, of Calais, is President; N. B. Nutt, Eastport, Treasurer, and George A. Murchie, Calais, Clerk.

Western New York & Pennsylvania.—John McGee, Foreman of the Buffalo shops has been appointed Master Mechanic of the shops at Olean, N. Y., to succeed Charles E. Turner, who resigned to become Superintendent of Motive Power of the Buffalo, Rochester & Pittsburg.

RAILROAD CONSTRUCTION,
Incorporations Surveys, Etc.

Beech Creek.—The building of the extension from Mehaffy, Clearfield county, to a point on the Pittsburg, McKeesport and Youghiogheny Railroad, on the Youghiogheny river, is regarded as an assured fact. Agents for the road have already secured rights of way through the territory through which it will pass from Mehaffy to Saltsburg. The road will be built along the Crooked and Blacklegs creeks, through Indiana and Armstrong counties, and will open up a fine coal field, which Eastern capitalists will begin developing as soon as the road is built. From Saltsburg a route has been surveyed up Loyalhanna creek to Latrobe, thence through the coke regions and along the Big Sewickley creek to the Youghiogheny river. From Saltsburg to Latrobe the road will open up a new coal and coke field. John B. McIntyre, of Jersey Shore, Pa., is Chief Engineer.

Bellefonte Central.—The company has decided to go ahead with the extension from State College to Pine Grove mills, a distance of six miles. The right of way has been secured, and a number of men are engaged in clearing. It is expected that the line will be completed in three months.

Buffalo & Susquehanna.—The grading on the Ansonia extension was completed this week. Contractor Craig's men are working in the Ansonia yard. The laying of the rails commenced last week. Temporary bridges will be put in to hasten the work. E. M. Atwell, of Gaines, has the contract to furnish the ties for the extension.

Canada Eastern.—This road, extending from Fredericton, N. B., northeast to Chatham on Miramichi Bay, 119 miles, is now owned and controlled by Mr. Alexander Gibson, who is the General Manager. (The names of the other officers appear in another column.) The branch from Chatham southward to Black Brook, five miles, now under construction, is being built by the company directly. The work is easy, and it is expected to have the branch finished within a month. Mr. J. A. Ruel, C. E., has charge of the work.

Chautauqua Lake.—It is reported that this railroad, which was sold by the sheriff a few weeks ago and bought in by New York capitalists is to be extended to Westfield, N. Y., about eight miles, where it will connect with the Lake Shore & Michigan Southern road.

Cincinnati, Union City & Chicago.—Harrison Township, Ind., has voted $38,000 to aid in building this rail-

road. This aid was voted last year, but owing to some informality the county commissioners did not levy the tax. The line is nearly completed between Union City and Portland, about 20 miles, and will be entirely finished between Union City, and Markel on the Chicago & Erie, a distance of about 60 miles, by Jan. 1. J. W. Fawcett, of Louisville, Ky., is President.

Duluth & Winnipeg.—The bill securing to this company the right to extend its railroad across the Chippewa and White Earth Indian Reservation in Minnesota, has been passed by the House of Representatives at Washington. The proposed extension of the company through Northen Minnesota to the Manitoba boundary line has been located through these reservations, and now that the company has received authority to build through them, the United States Senate having also passed a similar bill to that just mentioned, the work is likely to be undertaken promptly.

Ellwood Northern.—This company has been incorporated in Pennsylvania to build a railroad from a point on the Duck Run branch of the Pittsburg & Western, at or near the mouth of Slippery Rock creek, northeast up Slippery Rock creek to a point at or near Campbell. The length of the road will be 4½ miles The directors are: Merritt Greene, Edgeworth; William H. Dodds, A. A. Patterson and Dwight W. Morrow, of Allegheny; H. W. Mitchell, Pittsburg; A. G. Smith, Reading, and R. F. Bigham, of Carnegie. Merritt Greene is President.

Findlay, Ft. Wayne & Western.—It is reported that track l ying has been begun on this road between the Ohio line and Fort Wayne. Three miles of track has been laid and eleven miles of grading completed, leaving but six miles more to grade to reach that city. At Fort Wayne the Wabash track will be used to gain an entrance to the Union depot, and it is expected trains will be running within a month or two.

Glendon & Gulf.—Since this line was completed into the town of Bellville, N. C., about 13 miles from the eastern terminus at Gulf, early this year, construction work has been practically suspended. The officers have always stated however that they proposed ultimately to extend the line to Charlotte, N. C., about 80 miles beyond Glendon. A report from North Carolina now states that the plans for this extension are assuming a definite shape and that the work is likely to be started this year, although it is not probable that much work will be done beyond the limits of Chatham County, in which the town of Gulf is situated.

Harriman Coal & Iron Co.—We published last week an item about the resumption of active work on the Brushy Mountain extension of this railroad. We are enabled to give below some further facts about the work. The railroad is one of the projects set on foot by the East Tennessee Land Co. in developing the town of Harriman, Tenn., founded by that company. A belt line at Harriman was built before the company was forced into the receivership which stopped extension work. For over a year past the railroad has been operated by W. H Russell and A. A. Hopkins as Receivers. It has recently been leased to the Cumberland Construction Co. for a term of 15 months, that company agreeing to complete the extension to the coal fields on Brushy Mountain, a distance of 12 miles from the town limits. About four miles of this work has been finished since June and the entire line is to be built in two months more. The railroad will be about 24 miles long altogether, from Harriman, where it connects with the Southern Railway and with the Cincinnati, New Orleans & Texas Pacific, to the mines which are located in Morgan County, where convict labor is used. The work of grading, now in progress, is being done by the Tennessee Coal & Railway Co., lessee of the convict labor of the State of Tennessee, and the Schaffer, Nichols & Watkins Co. They have about 400 men now at work on the grading and the rock work, some of which is very heavy. The only bridge work will be the construction of a 4,000 foot trestle. The officers of the Cumberland Construction Co., and the lessees of the railroad, are C. P. Perin, President; J. E. Bateman, Vice-President; G. W. Chandler, Secretary & Treasurer; J. E. Rodes, General Manager, and C. A. Diemer, Civil Engineer, of Harriman, Tenn.

Middlesex Valley.—The extension now under way from Stanley into Geneva, N. Y., eight miles, will be ready for operation within a month. About 150 men are now working on the line under contractor J. G. Dolan. There is some talk of the extension of the line from Naples, the southern terminus of the road toward the Pennsylvania State line, but this report lacks definiteness and probably has no foundation.

Missouri Pacific.—Local commitees are being formed in Union County in the north of Louisiana to take whatever action may seem advisable to secure the extension of the Camden & Alexandria south of its present terminus at El Dorado, Ark. This road is a branch of the Missouri Pacific built in 1891, and is 30 miles long from Camden to El Dorado. J. D. Everett is Chairman and J. G. Trimble, Secretary of the committee now formed to urge upon the Missouri Pacific officers the extension of the line. Farmersville, a town about 40 miles southeast of El Dorado, is proposed as the present terminus of the extension, although if the road is built as far as that, it is likely to be continued to Monroe on another branch of the Missouri Pacific about 25 miles beyond Farmersville.

National of Tehauntepec.—This railroad across the Isthmus of Tehauntepec, 190 miles in length, has now been officially declared open for operation, after inspection by the officers of the Mexican Government, and through trains have begun running. Most of the concessions for the construction of railroads in Mexico provide for the reversion of the charter to the Mexican Government after a lapse of 99 years, but the contract for this railroad provides for its transfer to the Mexican Government immediately after completion, the Government assuming the responsibility of its operation. The original concession was granted some years ago to Edw. McMurdo, of London. He having failed to carry out his contract, the concession was rescinded and after a long interval a contract was made in 1892 with Messrs. C. S. Stanhope and J. H. Hampson, of the City of Mexico, and E. L. Corthell, of Chicago, to complete the construction of the railroad and the work has been finished under this contract with certain modifications.

The Atlantic terminus of the line is near the mouth of the Coatzacoalcas river, the Pacific terminus being at the town of Salina Cruz. Important works at the terminus on the Gulf of Mexico are now under way and a long iron pier is to be built at Salina Cruz. It will probably take nearly five years to complete the plans which the Mexican Government has outlined and it is estimated that the total cost of the work yet to be done will be $4,300,000.

New Roads.—James T. McCreery, an owner of considerable coal and timber property in Western Virginia along the New River, is reported to be interested in the organization of the new railroad which it is proposed to build from Hinton on the Chesapeake & Ohio along New River, and ultimately to Radford, Va., about 70 miles, on the Norfolk & Western.

H. S. Joseph, an engineer at Salt Lake City, is making a survey for a light railroad between Lehi, Utah, and a point on the north shore of Utah Lake, which is to be developed as a summer resort by John Beck. The distance is three miles.

Omaha, St. Paul & White Bear.—This company has been incorporated in Minnesota by W. P. Warren, of Troy, N. Y.; P. S. McGowan, Frank F. Bartlett, H. P. Finnegan and R. F. Ball, of St. Paul, members of the Wood Harvester Co. The object of the company is to build a belt line connecting the plant of the harvester company with railroads not already reaching their works.

Pennsylvania Midland.—It is announced that this new road now under construction to connect the Altoona division of the Pennsylvania railroad at Hollidaysburgh with the Bedford division of the same road at Bedford will be opened for business by Nov. 15, only about 25 miles of track being necessary to make the connection. Contractor E. A. Tennis has let sub-contracts as follows: 70-lb. steel rails, Bethlehem Iron Co; 14 iron bridges, Edgemore Bridge Co.; frogs and switches, Wharton Frog & Switch Co.; Nut Locks, National Nut Lock Co.; cars, Harlan & Hollingsworth Co., Wilmington, Del.; locomotives, Baldwin Locomotive Works, Philadelphia. George B. Orlady, of Huntington, Pa., is President of the company.

St. Louis, Avoyelles & Southwestern.—This company was recently granted a tax to enable it to build a railroad from Bunkie, La., and preparations are now being made to begin construction work. Ira W. Sylvester, Chief Engineer, with a corps of assistants, has arrived at Bunkie and begun the survey from that point to Marksville and Simmsport. The length of this line will be 44 miles. It is the intention of the company to have the road in operation about December 1. Mr. F. M. Welch, President of the company, is now in the North placing contracts for the rails and rolling stock.

Wiscasset & Quebec.—Good progress is being made with the construction work on this road. About 28 miles is now graded and ready for the ties between Wiscasset and Albion, Me. The wharves and pile bridges along the Wiscasset water front are fast approaching completion. The first cargo of rails has arrived. Trains are expected to be running the whole length of the line by Nov. 1.

Yazoo & Mississippi Valley.—That part of the Natchez, Jackson & Columbus Railroad, from Harriston northeast to Jackson, Miss., 70.5 miles was changed from narrow to standard gauge on Aug. 12. That part of the road from Harriston to Natchez, 27.8 miles, has been standard gauge for sometime. The Natchez, Jackson & Columbus road forms a connection between the Illinois Central's main line at Jackson with its Mississippi Valley division (the Yazoo & Mississippi Valley road) at Harriston, the line to Natchez giving it a terminus on the Mississippi River.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The statement prepared for the general Reorganization Committee in regard to the overstatement of the company's income in its published statements by over $7,000,000 in the four fiscal years since the last reorganization, was made public by the committee late on August 9, with President Reinhart's reply to the charges. The report is made by Mr. Stephen Little, Comptroller of the Denver & Rio Grande, who has prepared exhaustive special reports on the accounts of the Ohio & Mississippi, the Western Maryland, the Philadelphia & Reading and other roads. His report which shows such an elaborate system of covering up the actual income of the company, is a special report to the committee, detailing the method by which the earnings have been overstated.

The first classification of these overstatements is under the head of rebates, and Mr. Little finds that in the four years ending June 30, 1894, "the debits for rebates to shippers on the Atchison system aggregate $3,700,776, and on St. Louis & San Francisco, $205,879; or a total of $3,905,656. This sum was charged not to the earnings from whence it came, as it should have been, but to an account entitled, 'Auditor's Suspended Account—Special,' and reported from year to year as a good and available asset, while in fact it had no value whatever. Here I would inform you that in June, 1891, the so-called 'Auditor's Suspended Account—Special' of $1,318,582 on the Atchison books, as above, was credited with $1,612,110, thus setting up an apparent credit balance to it of $293,527; in other words, the $1,612,110 was capitalized into the account of 'Franchises and Property,' but for the purpose of this report I have reversed the entry, restoring that amount to the rebates, ('Auditor's Suspended Account—Special') and eliminating it from 'Franchises and Property.' If the credit of $1,612,110 was a proper one, the appropriate course for it would have been 'Franchises and Property' debtor to operating expenses, instead of a reduction of the rebates ('Auditor's Suspended Account—Special'), although, in the end, the effect on the income account would be precisely the same.

"The 'Auditor's Suspended Account—Special' was one of those accounts which, so far from being an asset, naturally closed, or should have been closed, against income or profit and loss. The entry by which this transfer of $1,612,110 was made from the rebates ('Auditor's Suspended Account—Special') to the account of 'Franchises and Property' is in these words, viz: 'Representing net charges to earnings and operating expenses made after Oct. 1, 1889, until Feb. 28, 1891, properly applicable to the operations of the company prior to the new mortgage indenture, as per telegram J. W. R., 173, 10-7-91,' from which it is made to appear that charges to this extent had been erroneously included in the operating expenses of the reorganized company between the dates mentioned instead of being added to the cost of the road and property. If this view can be supported by facts and figures, which so far I have been unable to obtain, then it would be proper for me to revise my judgment as to the $1,612,110; otherwise, I must hold that its transfer from rebates to capital was improper."

Mr. Little says that "an aggregate of $2,791,000 was credited from time to time on instructions from the East, to the earnings and expenses respectively, but which credits had no foundation in fact. Of this aggregate $2,010,000 was added to earnings, and $781,000 deducted from operating expenses, the sum of the two being debited to 'Auditor's Suspended Account.' There were two accounts of this character, one termed 'Auditor's Suspended Account,' which held the 'Additions to Earnings' and 'Deductions from Expenses,' and the other 'Auditor's Suspended Account—Special,' which held the rebates."

Under the title of improvements, Mr. Little says:

"The sum of $488,000 was in the period under consideration transferred improperly, as I contend, from operating expenses to 'Improvements' or capital account, these 'Improvements' being finally closed into the account of 'Franchises and Property,' which represents the cost of the road and property."

The report states that a traffic agreement was made in November, 1890, running to July, 1891, by the Atchison with other companies, under which a balance of $305,843 was charged against those companies. This the Atchison has been unable to collect, "and which is absolutely uncollectible, and should have been heretofore written off, though it still stands as an asset, and, hence, must now be written to the debit of profit and loss." These various accounts, Mr. Little finds, foot up $7,285,621 for the Atchison system, $205,879 for the St. Louis & San Francisco, a total of $7,491,500. "The whole of this amount," he says, "should, as I look at it, be written to the debit of profit and loss, except the $1,012,141 for Atchison, pertaining to the fiscal year 1893-94, which must go against, or in reduction of, the income for that year."

"Having thus explained the nature of the $7,491 500,000, carried in the income of the two systems to June 30, 1894, it becomes pertinent now to inquire how the proportion of this amount for the three years ended June 30, 1893, was treated in the report of the Atchison Company for the fiscal year 1893, the latest official issue. At that date, as will be seen from the tabular statement accompanying the amount for the Atchison system was $6,273,479, and for the St. Louis and San Francisco system $337,418 20, in all $6,610,897."

The analysis following reveals the accounts where this $6,610,897 was covered in the company's official balance sheet issued to the stockholders:

ATCHISON SYSTEM.

Cash deposits overstated:		
Official report, page 22	$3,095.686	
Should be	2,493,161	
Overstatement of deposits		$602 525
Bills payable understated:		
Official report, page 23	$6,809.249	
Should be	8,739,249	
Understatement of bills payable		1,930,000
Accounts receivable:		
Official report, page 22	$5,926,954	
Should be	4,286,110	
Overstatement of accounts receivable		1,640,843
Franchises and property:		
Official report, page 20	$93,751,498	
Should be	91,651,388	
Overstatement of franchises and property, which consist of $1,162,110 and $488,000,000, respectively.		2,100,110
Total Atchison system, June 30, 1893.		$6,273,479

ST. LOUIS & SAN FRANCISCO.

Brought forward	6,273,479
Deferred:	
Sundry accounts in process of adjustment (entering into the net debit balance of $317,914 on page 78 of the official report, St. Louis & San Francisco balance sheet)	337,418
Grand total both systems, June 30, 1893.	$6,610,897

Mr. Little's concluding paragraphs are as follows: "It only remains for me to add, on this phase of the subject, that the $337,418 pertaining to the St. Louis & Francisco forms part of the net debit balance of $317,914 entitled "Sundry accounts in process of adjustment," under head of "Deferred," on page 78 of the official report for the fiscal year ended June 30, 1893. This balance is made up of a number of accounts aggregating $568,395 on the debit side, and $250,480 on the credit side, thus:

Debit	$568,395
Credit	250,480
Net Debit	$317,914

"There is still another account, or transfer, in March, 1892, of $152,951, from 'Earnings and Expenses' to 'Franchises and Property,' with the propriety of which I do not agree. It reads as follows, and purports to be of the same character as the $1,612,110 heretofore fully described, viz.: 'Representing charges and credits applying on business prior to Oct. 1, 1889, in earnings and expense accounts, March 1, 1891, to March 1, 1892, and in interest, taxes and rental account Oct. 1, 1889, to March 31, 1892.' Unless this, too, can be supported by facts and figures, it must be added to the $7,491,500, which would augment the overstatement of income for the four years to $7,644,451. It should be distinctly understood that the accounts to which I refer in the tabular statement for the year ended June 30, 1894, antedate the receivership. As a matter for your information, I may add, further, that the balances represented in 'Auditor's Suspended Account—Special,' and 'Auditor's Suspended Account,' were not transferred from the Western to the Eastern books until March and April, 1894. I mean the company's, not the receiver's books."

President Reinhart, in his reply to Mr. Little's statement, begins by saying that "The earnings of the system for the four years amount to about $180,000,000 There is no charge that the disbursements have been overstated, or that any dividends or other payments have been made the basis of the alleged overstatement of earnings, and, as they are less than 4½ per cent. of the total earnings for the period named, you must assume that there is an entire lack of motive for a wrongful statement. To have stated the earnings at less than the actual figures would have been a great injustice to the security holders, and particularly to the income bondholders. Taking up Mr. Little's report, he says that $1,100,000 of earnings of the Atchison system, deducted from its income under the agreement with the St. Louis & San Francisco of 1887, as shown in the annual reports, and properly to be credited to the St. Louis & San Francisco, are totally ignored; and yet all the stock of that company is owned by the Atchison." . . . In other words, Mr. Little ignores $1,100,000 of actual earnings of the Atchison Railroad, and gives them no place in his statement of the earnings of the system. I also find that Mr. Little refuses to include a balance of $457,939, (United States currency) subsidy due from the Mexican Government to the Sonora railway (one of the Atchison auxiliary companies), which is an undisputed claim, recognized by the Mexican Government. I find also, that an item of $450,000 covering earnings on freight in transit on through billing for the last week in each month, has been ignored by Mr. Little. I further find that Mr. Little has either overlooked or refused to recognize $2,332,000 of interest earned from Jan. 1, 1890, to Dec. 23, 1893, (date of appointment of receiver), on advances made by the Atchison and San Francisco companies to the Atlantic & Pacific Railroad, which interest so earned is an asset of these two companies. and which, in adjustment of the accounts of the three companies named, must be treated as an asset of the Atchison and San Francisco companies, belonging to their income account. Still furthher do I find that Mr. Little has not included about $1,500,000 of

profit earned by the company upon its investment and terminal properties. The item of $1,612,110 and $152,951, making an aggregate of $1,765,061 which Mr. Little also refers to, were proper debits to the franchise and property accounts, for the reason that they represent expenditures made out of the revenues of the reorganized company subsequent to Oct. 1, 1889, but which applied to the operations of the property prior to the date of reorganization, and should have been cared for under the forty-two mortgages represented under the old company instead of the two mortgages of the reorganized company. This asset was used to offset charges which affected the other side of the income account, and as Mr. Little himself stated in his report, "in the end the effect on the income account will be precisely the same." The items I have mentioned more than cover the alleged overstatement of income for the period of Mr. Little's examination by about $500,000. I have not time in the limited period allowed me to go into further details. Mr. Little thinks that hundreds of thousands of dollars earned as a subsidy are not earnings, I think they are. He thinks that $1,100,000 deducted from Atchison earnings, and given under contract to another line in the system are not system earnings; I think they are. He thinks $1,500,000 of profits on investments is not income; I think it is. I repeat that the above items are sufficient to account for the alleged overstatement and $500,000 more, their total being over $8,000,000, and fully justify every statement the company has ever made."

Baltimore & Eastern Shore.—The foreclosure sale of this road under the decree of July 18 of the United States Circuit Court at Baltimore, will take place on August 29 at Salisbury, Md., R. D. Morrison being special master. The property to be sold will include the railroad extending across the eastern peninsula of Maryland from Claiborne on Eastern Bay in Talbot County to Salisbury, and thence to Ocean City on Delaware Bay, a distance of ninety miles.

Chicago, Milwaukee & St. Paul.—Suit has been begun in the United States Court in Milwaukee by the United States against the Chicago, Milwaukee & St. Paul for failing to comply with rulings of the Inter-State Commerce Commission with reference to reports and statistics required from the following roads: Hastings & Dakota, Southern Minnesota, and McGregor Missouri River. These roads have been subsidized by the government and, therefore, are required to report certain things not required of other railroads.

The net earnings of the railroad for the month of June show a decrease of $98,440, as compared with the same month last year. The following is a statement of the gross and net earnings and operating expenses of the entire system for the months of June, 1893 and 1894, and for the twelve months ending June 30:

	1894.	1893.	Dec.
Gross earn.	$2,904,971	$2,383,941	$521,030
Oper. expen	1,846,065	1,423,477	422,589
Net earn	$1,058,906	$960,464	$98,441
Twelve months to June 30:			
Gross earn.	35,743,428	31,327,950	4,415,478
Oper. expen	23,712,943	20,114,332	3,598,611
Net earn	$12,030,485	$11,213,618	$816,867

Denver, Leadville & Gunnison.—This railroad, commonly known as the South Park, which was last week separated from the Union Pacific system, will now be operated by the officials of the Union Pacific, Denver Gulf. Each will be run independently, though under the same management.

The first effort at retrenchment made by the new management was to reduce the wages of all employees. The South Park is narrow gauge with many sharp curves and steep grades, and the employees have received high wages. The new schedule, while a reduction, still compares favorably with other roads in Colorado. It is claimed that the road has been running behind at the rate of $20,000 a month. The line has a number of good coal mines which have been kept closed by the Union Pacific. The opening of these mines will probably be decided on. The line through Alpine Pass to Gunnison has been closed for several years. By the operation of this line the valuable anthracite and bituminous coal fields of Gunnison county could be reached. The road owns 60 locomotives, 1,100 freight cars, and 22 passenger cars. All of the consolidated bonds of the company are held by the American Loan & Trust Co., of New York, and foreclosure proceedings will probably be continued.

Denver & Rio Grande.—The results of the operation of the road for the year to June 30, with comparisons with the previous year, are reported in the following table:

	1894.	1893.	Dec.
Gross earn	$6,476,043	$9,317,646	$2,841,603
Oper. expen	3,972,551	5,282,048	1,309,533
Net earn	$2,503,492	$4,035,561	$1,532,069
Prop'tion of fixed charges, taxes, &c	2,415,831	2,633,253	247,422
Surp. for the 12 months	$87,661	$1,402,308	$1,314,647
Dividends on pref. stock		473,000	473,000
Balance	$87,661	$929,308	$841,647

Illinois Central.—The income from traffic for the month of July, 1894, and for the 12 months to June 30, as compared with the same period of 1893 is given below:

Month of July.	1894.	1893.	Inc. or Dec.
Gross earn	$1,097,316 est.	$1,789,736	D $692,420
Year to June 30th:			
Miles operated	2,888	2,888	
Gross Earn	20,657,464	20,095,190	I 562,274
Oper. expen. and taxes	14,369,416	14,283,934	I 85,482
Net earn	$6,288,048	$5,811,256	I $476,792

Louisville & Nashville.—An appeal is to be made by the Louisville & Nashville from the recent decision of Chancellor Edwards of Kentucky, which made permanent an injunction secured by the State of Kentucky to prevent the Louisville & Nashville assuming control of the Chesapeake, Ohio & Southwestern in accordance with an agreement made by that company and the Illinois Central for the purchase of the railroad stock.

Manitoba & Northwestern.—The Master in Chancery has appointed A. M. Nanton Receiver for the first 180 miles of this road. It extends from Portage la Prairie, Man., on the Canadian Pacific, to Yorkton, Man., 223 miles. The present situation of the road is a peculiar one. By order of the Court of Queen's Bench, Mr. Montague Allan, of Montreal, was appointed receiver of the whole road. The total mileage is about 300 miles, 180 of which (known as the first portion), belongs to English bondholders. Owing to things not working smoothly, English and Canadian shareholders have had slight differences. After the receiver was appointed in June, 1892, an understanding was arrived at and things went smoothly for some time, but since June, 1893, litigation has been constantly going on between the rival factions. The result of all this is that a receiver for the first portion of the road has been appointed. Complications may arise through the two appointments, but the parties are endeavoring to make an adjustment of affairs, and conferences are being held with a view of arriving at a modus vivendi.

Middle Georgia & Atlantic.—The sale of this railroad which had been advertised to take place at Savannah on August 10, was stopped by an injunction from the Georgia Superior Court, which had been obtained by A. O. Granger, of Philadelphia, who owns over $21,000 of the capital stock of the seaboard Co., which controls the railroad. The sale was to have been made to secure the payment of the so-called syndicate loan amounting to $175,000 at 8 per cent. interest, which was negotiated to complete the railroad and for which first mortgage bonds of the company were pledged as security. The debt is now over $190,000. It is said that the railroad did not receive the full amount of the loan and that the present sale of the property is being forced by certain directors and stockholders of the Seaboard Co., to the disadvantage of the minority stockholders.

Mississippi River & Bonne Terre.—A report was printed last week that the Chicago, Burlington & Quincy had purchased this railroad, extending from Riverside, Mo., on the Mississipi River to Doe Run, near the mines of the St. Joseph Lead Co., which owns the property. It made a curious story, but of course met with a prompt denial by officers of both companies. How it could have been originated it is not easy to imagine. There is no junction between the two railroads, Riverside being over twenty miles south of St. Louis and, as stated, the railroad is controlled by the St. Joseph Lead Co., its chief business being to transport the product of the mines of that company to the Mississippi River.

Mobile & Ohio.—The company makes the following statement of income for the year ending June 30:

	1894.	1893.
Total earnings	$3,253,691	$3,358,470
Operating expenses	2,036,719	2,259,189
Net earnings	$1,216,972	$1,099,281
Interest on funded debt, rentals, &c	1,037,323	1,042,216
Surplus	$179,648	$57,065
Other expenditures:		
New construction	7,935	18,805
New equipment	164,396	192,096
Total	$172,331	$210,901
Surplus over expenditures	$7,317	.....
Excess of expenditures	.....	$153,836

New York Central & Hudson River.—The gross earnings for the month of July, 1894, were $3,926,231, a decrease of $768,229 from the earnings for the same month in 1893. The mileage operated this year was 2321, an increase of 75 miles.

Northern Pacific.—The First Mortgage Bondholders' Committee of the Spokane & Palouse Railway Company has negotiated a lease of the company's road to the receivers of the Northern Pacific under which interest on the bonds at the rate of 4 per cent. per annum from May 1, 1893, to Nov. 1, 1894, and at the rate of 5 per cent. per annum from Nov. 1, 1894, to May 1, 1897, is to be paid as rental besides taxes, assessments, insurance, and expenses of operation and maintenance. This arrangement is subject to the approval of the court which appointed the Northern Pacific receivers, and to the consent of the holders of a majority in interest of the outstanding trust certificates of the New York Security and Trust Company, issued under the bondholders' agreement of Dec. 30, 1893. The committee recommends the certificate holders to give their consent, and those who have not deposited their securities under the agreement can do so on or before Sept. 1. The committee is unanimously of the opinion that the proposed arrangement is for the benefit of all the certificate holders, and the best that can be made, and much to be preferred to litigation. The Spokane & Palouse is a branch from the Northern Pacific main line, at Spokane, southward about 110 miles, and was leased to the Northern Pacific in 1886 for 999 years.

Oregon Railway & Navigtion Co.—Receiver McNeil has filed in the United States Court a petition praying that the lease of the Oregon Railway Extension Company and the Washington & Idaho Railway Company be set aside and the receiver released from the payment of rents for these lines under the terms of the lease. The petition was set for hearing Sept. 1. United States District Judge Bellinger has ratified the traffic agreement between the Great Northern and the Oregon Railway & Navigation Company and the Union Pacific and the Oregon Railway & Navigation Company.

Texas Western.—There seems to be little probability of the company ever having to defend the suit instituted by the Attorney General of Texas in the State courts to forfeit the company's charter. The suit was begun because the property had been allowed to run down until it was unsafe to run trains. The court finally issued an order forbidding the operation of the railroad and the Attorney General began the forfeiture suit. The road, however, is now being thoroughly repaired and a lease has been made with E. A. Campbell for the operation of the line and it is understood that the Attorney General has consented to have the suit dismissed at the next session of the district court.

TRAFFIC.

Traffic Notes.

It is reported that the Wholesale fruit dealers of Boston will have a good many of their peaches this year sent from New York over the New York Central and New York and New England, via Brewsters. In previous years they have been sent over the New Haven road in a special peach train, but owing to the small crop no special train will be run this year.

The steamship Paris of the American Line on her trip from New York on Aug. 15, took about 11 car loads of California fresh fruit for London, mostly Bartlett pears. California fruit was sent to London two years ago, but rates were too high. It is said that now the fruit is carried through at about $700 a car load, which is only about $75 above the rate to New York City.

The Western of Alabama, has notified cotton shippers that it will hereafter pay only 35 cents a bale for compressing cotton, instead of 50 cents, the rate which has been universal for a long time. From a Southern paper it appears that the shippers are loudly objecting to the reduction.

There was a flurry at St. Louis last week in consequence of the announcement by the Wiggins Ferry Co., that freight rates between St. Louis and East St. Louis would be reduced from about $7 a car to $4, but the reduced tariff was withdrawn the next day.

Excursions on the Pennsylvania.

The following from the Philadelphia Record illustrates the resources of a single railroad company. Old time managers who never could run an excursion to one point without scrimping the passenger car supply at every other point, and then found it necessary to borrow from neighboring roads every car that could be got, may well rub their eyes at a statement like the following:

"The Pennsylvania Railroad and its affiliated lines handled on Thursday, Aug. 9, the biggest excursion business of the season, when 15,400 passengers were carried to the various Atlantic coast and Chesapeake Bay resorts. From Pittsburg and points further west 1,800 people took advantage of the special ten-day excursion rate to Atlantic City, Cape May, Ocean Grove and Asbury Park, making by far the largest excursion party that has ever left Pittsburg for the Atlantic coast. The majority of these left Pittsburg on Thursday evening, 28 sleeping cars being required.

"The other excursions on Thursday were one of 1,400 persons from Philadelphia, Chester and Wilmington to Tolchester Beach; one of 3,500 to Ocean Grove fom Philadelphia and New York; one of 5,600 from Philadelphia to Atlantic City; one of 600 up the Hudson River from Philadelphia and points on the New York division; 600 people from Philadelphia and points on the Philadelphia, Wilmington & Baltimore to Rehoboth Beach; 300 from points on the Philadelphia & Erie to seashore points, and 600 from Philadelphia to Brown's-Mills-in-the-Pines."

The heavy excursion business from Philadelphia to the seashore resorts, 75 miles southeast of that city is heavy every year, as has been noted in the *Railroad Gazette*, and the Reading, as well as the Pennsylvania, carries thousands.

Chicago Traffic Matters.

CHICAGO, Aug. 15, 1894.

Last week's shipments of freight showed a general recovery on all lines, and the roads are encouraged to believe that the tonnage for the next 60 days will be extremely gratifying. Notwithstanding the destruction of the corn crop in many sections, there will be a large movement possibly as much as last year. The Burlington reports show that the territory on its lines has not suffered materially. The Rock Island people are disposed to take a gloomy view of the situation, but outsiders seem to think that things are not as bad as represented.

Lake shipments from here continue extremely light. As an indication of the total collapse of the grain trade at this port, the Central Vermont boat, James, which always runs between Chicago and Ogdensburg, was compelled to go to Duluth to secure a return load on its last trip. There is nothing in sight to speak of except soft coal. In consequence there is considerable cutting in rates on merchandise as well as grain, which the rail connections of the lake lines seem powerless to stop. While the all-rail lines are complaining, the end of the season is approaching, and it is not probable that any of them will care to meet the rates and run the risk of demoralizing all east bound business.

The annual war on wool rates is now on, and, as usual, rates on this commodity are on a sliding scale. This is one of the curious phases of traffic warfare. If wool rates should be maintained one season, it would seem that the millennium was at hand.

The officers of the Christian Endeavor Society are "fishing" for rates for their convention next year. The western lines have been asked for rates to San Francisco, but decided not to make any rates at present, or until the society should decide upon a place of holding the convention.

Traffic officials are disposed to think that the best solution of the Atchison imbroglio has been arrived at. Most of the traffic men do not care to approach such subjects too closely unless obliged to, as one can never be sure where lightning will strike next.

Charges are being made of rate cutting via Memphis, which is diverting a considerable amount of traffic from Chicago and St. Louis.

The Ohio Southern makes answer to the charge of having stocked the Chicago market with tickets to the Wheelmen's convention at Denver, that it sold only seven tickets all told for this event.

Indications point to a grouping of city ticket offices on Adam street between Clark and Dearborn, the first of next May. A number of western roads have leased offices in a new building now in process of construction on one corner of the block, and it is reported that the Michigan Central, Grand Trunk, Wabash, Lake Shore, Nickel Plate and Baltimore & Ohio are to locate in the opposite corner of the block where the Burlington now is, the building being remodeled to accommodate them, in addition to the Burlington.

The Southwestern Traffic Association, at its meeting here last week took steps for the inauguration of a weighing and inspection bureau, under the direction of the chairman.

The Missouri, Kansas & Texas, in connection with the Big Four and Chesapeake & Ohio has made a $25 rate to Washington from Texas points, for the conclave of the Knights of Pythias, which it justifies on the ground of meeting the competition of the Cotton Belt road.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending August 11, amounted to 49,255 tons, against 47,783 tons during the preceding week, an increase of 1,462 tons and against 52,042 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Aug. 11.		W'k to Aug. 4.	
	Tons.	P. c.	Tons.	P.c.
Michigan Central	6,015	12.2	4,181	8.7
Wabash	3,548	7.2	3,186	6.7
Lake Shore & Mich. South	6,107	12.4	6,467	13.5
Pitts., Ft. Wayne & Chicago	6,717	13.6	6,462	13.5
Pitts., Cin., Chicago & St. L.	4,795	9.7	6,055	12.7
Baltimore & Ohio	3,240	6.6	3,077	6.4
Chicago & Grand Trunk	4,467	9.1	3,536	7.4
New York, Chic. & St. Louis	5,812	11.8	7,278	15.3
Chicago & Erie	7,065	14.4	5,894	12.3
C., C., C. & St. Louis	1,489	3.0	1,647	3.5
Totals	49,255	100.0	47,783	100.0

Of the above shipments 1,742 tons were flour, 12,668 tons grain and millstuff, 10,981 tons cured meats, 10,584 tons dressed beef, 1,334 tons butter, 2,509 tons hides and 4,447 tons lumber. The three Vanderbilt lines carried 36.4 per cent., the two Pennsylvania lines 23.3 per cent. Lake lines carried 49,725 tons against 51,705 tons last week.